FANUC Series 30*i*/300*i*/300*i*s-MODEL A
FANUC Series 31*i*/310*i*/310*i*s-MODEL A5
FANUC Series 31*i*/310*i*/310*i*s-MODEL A
FANUC Series 32*i*/320*i*/320*i*s-MODEL A

PARAMETER MANUAL

B-63950EN/02

In this manual we have tried as much as possible to describe all the various matters.
However, we cannot describe all the matters which must not be done, or which cannot be done, because there are so many possibilities.
Therefore, matters which are not especially described as possible in this manual should be regarded as "impossible".

DEFINITION OF WARNING, CAUTION, AND NOTE

This manual includes safety precautions for protecting the user and preventing damage to the machine. Precautions are classified into Warning and Caution according to their bearing on safety. Also, supplementary information is described as a Note. Read the Warning, Caution, and Note thoroughly before attempting to use the machine.

> ⚠ **WARNING**
>
> Applied when there is a danger of the user being injured or when there is a danger of both the user being injured and the equipment being damaged if the approved procedure is not observed.

> ⚠ **CAUTION**
>
> Applied when there is a danger of the equipment being damaged, if the approved procedure is not observed.

> **NOTE**
>
> The Note is used to indicate supplementary information other than Warning and Caution.

- Read this manual carefully, and store it in a safe place.

PREFACE

Applicable models

The models covered by this manual, and their abbreviations are :

Model name	Abbreviation	
FANUC Series 30*i*-MODEL A	30*i* –A	Series 30*i*
FANUC Series 300*i*-MODEL A	300*i*–A	Series 300*i*
FANUC Series 300*i*s-MODEL A	300*i*s–A	Series 300*i*s
FANUC Series 31*i*-MODEL A	31*i* –A	Series 31*i*
FANUC Series 31*i*-MODEL A5	31*i* –A5	
FANUC Series 310*i*-MODEL A	310*i*–A	Series 310*i*
FANUC Series 310*i*-MODEL A5	310*i*–A5	
FANUC Series 310*i*s-MODEL A	310*i*s–A	Series 310*i*s
FANUC Series 310*i*s-MODEL A5	310*i*s–A5	
FANUC Series 32*i*-MODEL A	32*i* –A	Series 32*i*
FANUC Series 320*i*-MODEL A	320*i*–A	Series 320*i*
FANUC Series 320*i*s-MODEL A	320*i*s–A	Series 320*i*s

NOTE

1. For an explanatory purpose, the following descriptions may be used according to the types of path control used:
   - T series: For the lathe system
   - M series: For the machining center system
2. Unless otherwise noted, the model names 31*i*/310*i*/310*i*s-A, 31*i*/310*i*/310*i*s-A5, and 32*i*/320*i*/320*i*s-A are collectively referred to as 30*i*/300*i*/300*i*s. However, this convention is not necessarily observed when item 3 below is applicable.
3. Some functions described in this manual may not be applied to some products.
   For details, refer to the DESCRIPTIONS (B-63942EN).

Related manuals of
Series 30*i*/300*i*/300*i*s- MODEL A
Series 31*i*/310*i*/310*i*s- MODEL A
Series 31*i*/310*i*/310*i*s- MODEL A5
Series 32*i*/320*i*/320*i*s- MODEL A

The following table lists the manuals related to Series 30*i*/300*i* /300*i*s-A, Series 31*i*/310*i* /310*i*s-A, Series 31*i*/310*i* /310*i*s-A5, Series 32*i*/320*i* /320*i*s-A. This manual is indicated by an asterisk(*).

Table 1 Related manuals

Manual name	Specification number	
DESCRIPTIONS	B-63942EN	
CONNECTION MANUAL (HARDWARE)	B-63943EN	
CONNECTION MANUAL (FUNCTION)	B-63943EN-1	
USER'S MANUAL (Common to T series/M series)	B-63944EN	
USER'S MANUAL (T series)	B-63944EN-1	
USER'S MANUAL (M series)	B-63944EN-2	
MAINTENANCE MANUAL	B-63945EN	
PARAMETER MANUAL	B-65950EN	*
Programming		
Macro Compiler / Macro Executor PROGRAMMING MANUAL	B-63943EN-2	
Macro Compiler OPERATOR'S MANUAL	B-66264EN	
C Language Executor OPERATOR'S MANUAL	B-63944EN-3	
PMC		
PMC PROGRAMMING MANUAL	B-63983EN	
Network		
PROFIBUS-DP Board OPERATOR'S MANUAL	B-63994EN	
Fast Ethernet / Fast Data Server OPERATOR'S MANUAL	B-64014EN	
DeviceNet Board OPERATOR'S MANUAL	B-64044EN	
Operation guidance function		
MANUAL GUIDE *i* OPERATOR'S MANUAL	B-63874EN	
MANUAL GUIDE *i* Set-up Guidance OPERATOR'S MANUAL	B-63874EN−1	

Related manuals of SERVO MOTOR αis/αi series

The following table lists the manuals related to SERVO MOTOR αis/αi series

Table 2 Related manuals

Manual name	Specification number
FANUC AC SERVO MOTOR αis series FANUC AC SERVO MOTOR αi series DESCRIPTIONS	B-65262EN
FANUC AC SERVO MOTOR αis series FANUC AC SERVO MOTOR αi series PARAMETER MANUAL	B-65270EN
FANUC AC SPINDLE MOTOR αi series DESCRIPTIONS	B-65272EN
FANUC AC SPINDLE MOTOR αi series PARAMETER MANUAL	B-65280EN
FANUC SERVO AMPLIFIER αi series DESCRIPTIONS	B-65282EN
FANUC AC SERVO MOTOR αis series FANUC AC SERVO MOTOR αi series FANUC AC SPINDLE MOTOR αi series FANUC SERVO AMPLIFIER αi series MAINTENANCE MANUAL	B-65285EN

Either of the following servo motors and the corresponding spindle can be connected to the CNC covered in this manual.

- FANUC SERVO MOTOR αis series
- FANUC SERVO MOTOR αi series

This manual mainly assumes that the FANUC SERVO MOTOR αi series of servo motor is used. For servo motor and spindle information, refer to the manuals for the servo motor and spindle that are actually connected.

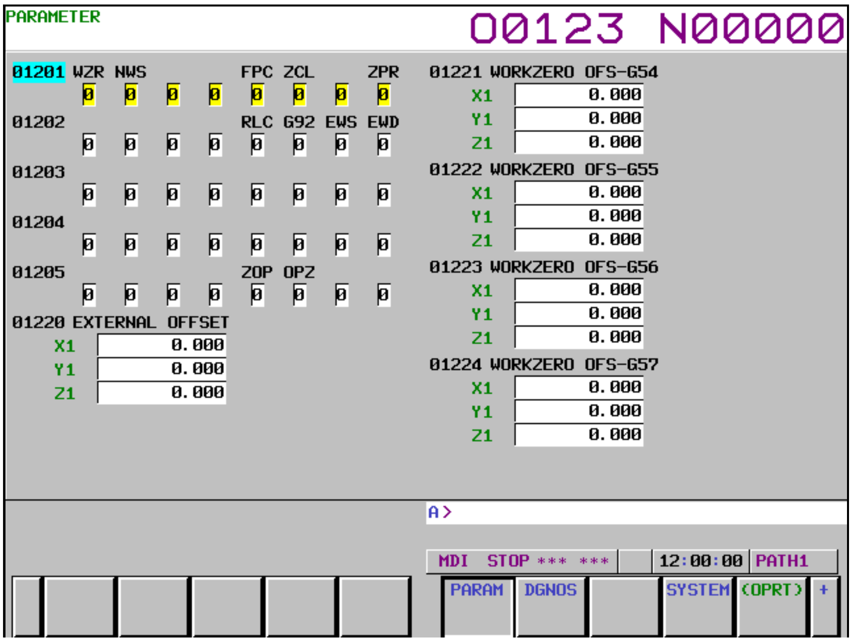
TABLE OF CONTENTS

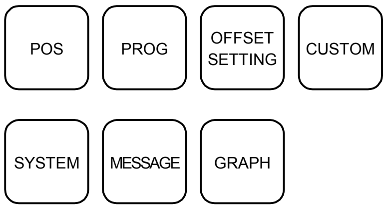
APPENDIX

1 DISPLAYING PARAMETERS

Follow the procedure below to display parameters.

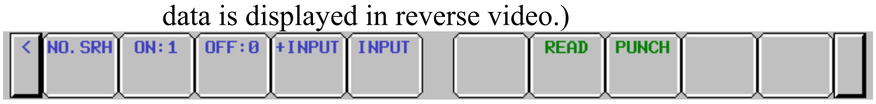
1 Press the  function key on the MDI as many times as required, or alternatively, press the  function key once, then the PARAM section display soft key. The parameter screen is then selected.





Function key

2 The parameter screen consists of multiple pages. Use step (a) or (b) to display the page that contains the parameter you want to display.
   (a) Use the page select key or the cursor move keys to display the desired page.
   (b) Enter the data number of the parameter you want to display from the keyboard, then press the [NO.SRH] soft key. The parameter page containing the specified data number appears with the cursor positioned at the data number. (The data is displayed in reverse video.)



> **NOTE**
> If key entry is started with the section select soft keys displayed, they are replaced automatically by operation select soft keys including [NO.SRH]. Pressing the [(OPRT)] soft key can also cause the operation select keys to be displayed.

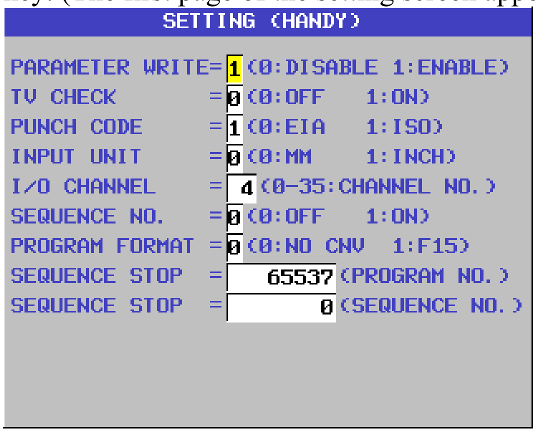
2 SETTING PARAMETERS FROM MDI

Follow the procedure below to set parameters.

1 Place the NC in the MDI mode or the emergency stop state.

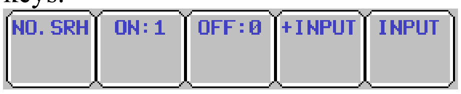
2 Follow the substeps below to enable writing of parameters.

2-1 To display the setting screen, press the OFFSET SETTING function key as many times as required, or alternatively press the OFFSET SETTING function key once, then the [SETTING] section select soft key. (The first page of the setting screen appears.)



2-2 Position the cursor on "PARAMETER WRITE" using the cursor move keys.

2-3 Press the [(OPRT)] soft key to display operation select soft keys.



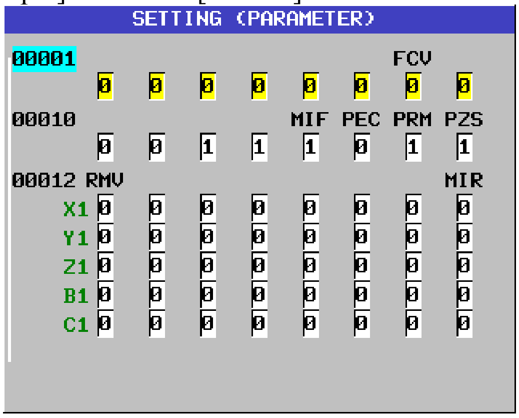
2-4 To set "PARAMETER WRITE=" to 1, press the [ON:1] soft key, or alternatively enter 1 and press the [INPUT] soft key. From now on, the parameters can be set. At the same time an alarm condition (SW0100 PARAMETER WRITE ENABLE) occurs in the CNC.

3 To display the parameter screen, press the SYSTEM function key as many times as required, or alternatively press the SYSTEM function key once, then the PARAM section select soft key. (See "1. Displaying Parameters.")

4 Display the page containing the parameter you want to set, and position the cursor on the parameter. (See "1. Displaying Parameters.")

5 Enter data, then press the [INPUT] soft key. The parameter indicated by the cursor is set to the entered data.

[Example] 12000 [INPUT]



Data can be entered continuously for parameters, starting at the selected parameter, by separating each data item with a semicolon (;).

[Example] Entering 10;20;30;40 and pressing the INPUT key assigns values 10, 20, 30, and 40 to parameters in order starting at the parameter indicated by the cursor.

6 Repeat steps (4) and (5) as required.

7 If parameter setting is complete, set "PARAMETER WRITE=" to 0 on the setting screen to disable further parameter setting.

8 Reset the NC to release the alarm condition (SW0100).
If an alarm condition (PW0000 PLEASE TURN OFF POWER) occurs in the NC, turn it off before continuing operation.

3 INPUTTING AND OUTPUTTING PARAMETERS THROUGH THE READER/PUNCHER INTERFACE

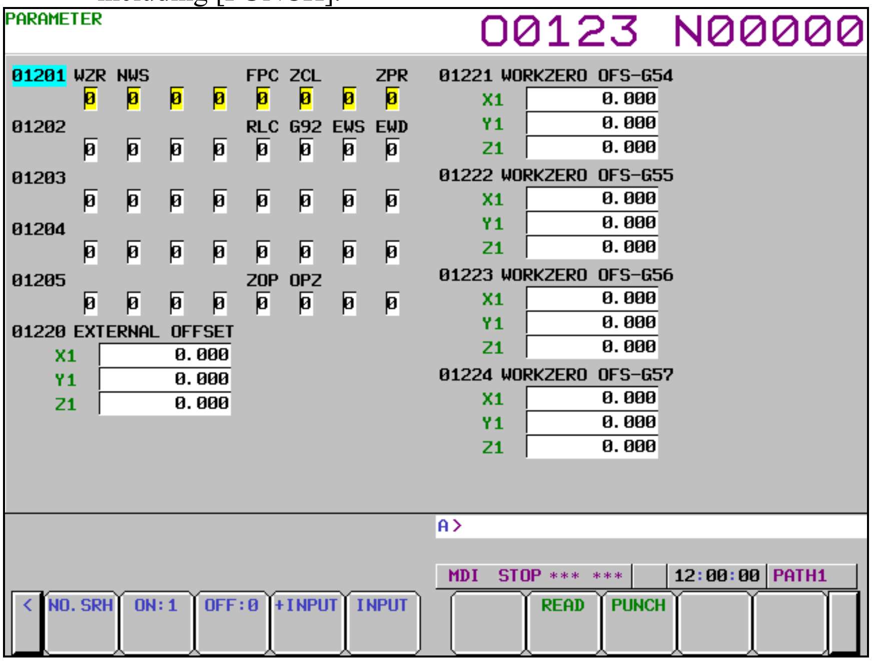
This section explains the parameter input/output procedures for input/output devices connected to the reader/puncher interface.
The following description assumes the input/output devices are ready for input/output. It also assumes parameters peculiar to the input/output devices, such as the baud rate and the number of stop bits, have been set in advance. (See Section 4.5.)

3.1 OUTPUTTING PARAMETERS THROUGH THE READER/PUNCHER INTERFACE

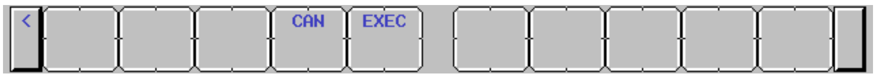
1 Select the EDIT mode or set to Emergency stop.

2 To select the parameter screen, press the SYSTEM function key as many times as required, or alternatively press the SYSTEM function key once, then the PARAM section select soft key.

3 Press the [(OPRT)] soft key to display operation select soft keys, then press the forward menu key located at the right-hand side of the soft keys to display another set of operation select keys including [PUNCH].



4 Pressing the [PUNCH] soft key changes the soft key display as shown below:



5 Press the [EXEC] soft key to start parameter output. When parameters are being output, "PNCH" blinks in the state display field on the lower part of the screen.

6 When parameter output terminates, "PNCH" stops blinking. Press the RESET key to interrupt parameter output.

3.2 INPUTTING PARAMETERS THROUGH THE READER/PUNCHER INTERFACE

1 Place the NC in the emergency stop state.

2 Enable parameter writing.

2-1 To display the setting screen, press the OFFSET SETTING function key as many times as required, or alternatively press the OFFSET SETTING function key once, then the [SETING] section select soft key. The first page of the setting screen appears.

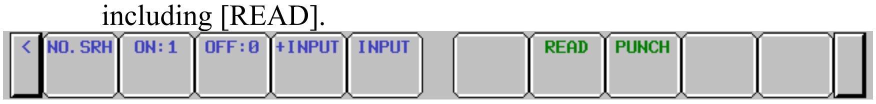
2-2 Position the cursor on "PARAMETER WRITE" using the cursor move keys.

2-3 Press the [(OPRT)] soft key to display operation select soft keys.

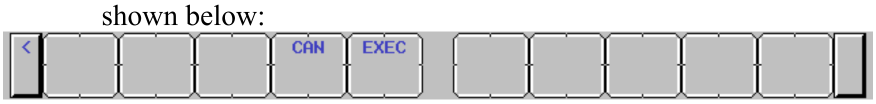
2-4 To set "PARAMETER WRITE=" to 1, press the [ON:1] soft key, or alternatively enter 1, then press the [INPUT] soft key. From now on, parameters can be set.
At the same time an alarm condition (SW0100 PARAMETER WRITE ENABLE) occurs in the NC.

3 To select the parameter screen, press the SYSTEM function key as many times as required, or alternatively press the SYSTEM key once, then [PARAM] soft key.

4 Press the [(OPRT)] soft key to display operation select keys, then press the forward menu key located at the right-hand side of the soft keys to display another set of operation select soft keys including [READ].



5 Pressing the [READ] soft key changes the soft key display as shown below:



6 Press the [EXEC] soft key to start inputting parameters from the input/output device. When parameters are being input, "READ" blinks in the state display field on the lower part of the screen.

7 When parameter input terminates, "READ" stops blinking. Press the RESET key to interrupt parameter input.

8 When parameter read terminates, "INPUT" stops blinking, and an alarm condition (PW0100) occurs in the NC. Turn it off before continuing operation.

3.3 I/O FORMATS

This section describes the I/O formats of parameters.
Parameters are classified by data format as follows:

Data format	Remarks
Bit	Data of these formats is represented by an 8-digit binary number, with each digit corresponding to a bit.
Bit machine group	
Bit path	
Bit axis	
Bit spindle	
Byte	The setting range of data varies from one parameter to another. For details, refer to the description of each parameter.
Byte machine group	
Byte path	
Byte axis	
Byte spindle	
Word	
Word machine group	
Word path	
Word axis	
Word spindle	
2-word	
2-word machine group	
2-word path	
2-word axis	
2-word spindle	
Real	
Real machine group	
Real path	
Real axis	
Real spindle	

3.3.1 Keywords

The alphabetic characters listed below are used as keywords.
A numeric value after each keyword has the following meaning:

Keyword	Meaning of a numeric value that follows
N	Parameter number
Q	Data identifier (1: Parameter data, 0: Pitch error compensation data)
T	Machine group number (1 and up) of a machine group type parameter
L	Path number (1 and up) of a path type parameter
A	Controlled axis number (1 and up) of an axis type parameter
S	Spindle number (1 and up) of a spindle type parameter
P	Value of a parameter independent of inch/metric switching
M	Metric input value of a parameter dependent on inch/metric switching
I	Inch input value of a parameter dependent on inch/metric switching

3.3.2 Inch/Metric Switching

For parameters dependent on inch/metric switching such as those for length and feedrate, whether data is inch data or metric data is specified by the input mode in the case of input from the MDI panel, or by the keyword I or M prefixed to the data in the case of input from an external I/O device. The keyword I or M is added also when data is output from an external I/O device.
If the input mode or keyword differs from the actually used mode as in a case where data input in the inch mode is used in the metric mode, the CNC performs automatic data conversion. So, data need not be converted according to a mode change. Moreover, when parameter data is displayed, the data is converted according to the display mode. However, when data is output from an external I/O device, the original data is output according to the original keyword.

3.3.3 Bit Format

N	*****	Q1	P	********	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
An 8-digit binary number after P represents the bit values (0/1) of a parameter, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example
N00010Q1P00000001;
Parameter No. 10
Parameter value
Bit 0 is set to 1, and the other bits are set to 0.

3.3.4 Bit Machine Group Format

N	*****	Q1	T	**	P	********	T	**	P	********	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after T represents a machine group number (1 and up).
An 8-digit binary number after P represents the bit values (0/1) of a parameter for each machine group, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01005Q1T1P10000001T2P10000001 ;
Parameter No. 1005
Parameter value
1st machine group:
Bits 0 and 7 are set to 1, and the other bits are set to 0.
2nd machine group:
Bits 0 and 7 are set to 1, and the other bits are set to 0.

3.3.5 Bit Path Format

N	*****	Q1	L	**	P	********	L	**	P	********	· · · ;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after L represents a path number (1 and up).
An 8-digit binary number after P represents the bit values (0/1) of a parameter for each path, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01005Q1L1P10000001L2P10000001.......;
Parameter No. 1005
Parameter value
Path 1:
Bits 0 and 7 are set to 1, and the other bits are set to 0.
Path 2:
Bits 0 and 7 are set to 1, and the other bits are set to 0.

3.3.6 Binary Axis Format

N	*****	Q1	A	**	P	********	A	**	P	********	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after A represents a controlled axis number (1 and up).
An 8-digit binary number after P represents the bit values (0/1) of a parameter for each controlled axis, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01005Q1A1P10000001A2P10000001A3P10000001.......;
Parameter No. 1005
Parameter value
1st axis:
Bits 0 and 7 are set to 1, and the other bits are set to 0.
2nd axis:
Bits 0 and 7 are set to 1, and the other bits are set to 0.
3rd axis:
Bits 0 and 7 are set to 1, and the other bits are set to 0.
▪

3.3.7 Bit Spindle Format

N	*****	Q1	S	**	P	********	S	**	P	********	･ ･ ･	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after S represents a spindle number (1 and up).
An 8-digit binary number after P represents the bit values (0/1) of a parameter for each spindle, with the first digit corresponding to bit 0 and the eighth digit corresponding to bit 7.
Leading zeros may not be omitted.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N05603Q1S1P00001000S2P00001000S3P00000000;
Parameter No. 5603
Parameter value
1st spindle:
Bit 3 is set to 1, and the other bits are set to 0.
2nd spindle:
Bit 3 is set to 1, and the other bits are set to 0.
3rd spindle:
All bits are set to 0.

3.3.8 Byte/Word/Two-Word Format

N	*****	Q1	P	********	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after P represents a parameter value (integer).
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N00100Q1P31515;
Parameter No. 100
Parameter value 31515

3.3.9 Byte/Word/Two-Word Machine Group Format

N	*****	Q1	T	**	P	******	T	**	P	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after T represents a machine group number (1 and up).
A numeric value after P represents the value (integer) of a parameter for each machine group.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01020Q1T1P88T2P89......;
Parameter No. 1020
Parameter value 1st machine group: 88
2nd machine group: 89
▪

3.3.10 Byte/Word/Two-Word Path Format

N	*****	Q1	L	**	P	******	L	**	P	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after L represents a path number (1 and up).
A numeric value after P represents the value (integer) of a parameter for each path.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01020Q1L1P88L2P89L3P90......;

Parameter No.	1020	
Parameter value	Path 1:	88
	Path 2:	89
	Path 3:	90

▪

3.3.11 Byte/Word/Two-Word Axis Format

N	*****	Q1	A	**	P	******	A	**	P	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after A represents a controlled axis number (1 and up).
A numeric value after P represents the value (integer) of a parameter for each controlled axis.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01020Q1A1P88A2P89A3P90A4P66......;

Parameter No.	1020	
Parameter value	1st axis:	88
	2nd axis:	89
	3rd axis:	90
	4th axis:	66

▪

3.3.12 Byte/Word/Two-Word Spindle Format

N	*****	Q1	S	**	P	******	S	**	P	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after S represents a spindle number (1 and up).
A numeric value after P represents the value (integer) of a parameter for each spindle.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N05680Q1S1P19S2P19S3P0S4P0;

Parameter No.	5680	
Parameter value	1st spindle:	19
	2nd spindle:	19
	3rd spindle:	0
	4th spindle:	0

3.3.13 Real Number Format

N	*****	Q1	P	******	;

N	*****	Q1	M	******	;

N	*****	Q1	I	******	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after each of P, M, and I represents the value (real number) of a parameter.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example
N01451Q1P5000.0;
Parameter No. 1451
Parameter value 5000.0

3.3.14 Real Number Machine Group Format

N	*****	Q1	T	**	P	******	T	**	P	******	· · · ;

N	*****	Q1	T	**	M	******	T	**	M	******	· · · ;

N	*****	Q1	T	**	I	******	T	**	I	******	· · · ;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after T represents a machine group number (1 and up).
A numeric value after each of P, M, and I represents the value (real number) of a parameter for each machine group.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example
N01220Q1T1M50.0T2M60.0........;
Parameter No. 1220
Parameter value 1st machine group: 50.0
2nd machine group: 60.0
.

3.3.15 Real Number Path Format

N	*****	Q1	L	**	P	******	L	**	P	******	· · ·	;

N	*****	Q1	L	**	M	******	L	**	M	******	· · ·	;

N	*****	Q1	L	**	I	******	L	**	I	******	· · ·	;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after L represents a path number (1 and up).
A numeric value after each of P, M, and I represents the value (real number) of a parameter for each path.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01220Q1L1M50.0L2M60.0L3M70.0 ;

Parameter No.	1220	
Parameter value	Path 1:	50.0
	Path 2:	60.0
	Path 3:	70.0

3.3.16 Real Number Axis Format

N	*****	Q1	A	**	P	******	A	**	P	******	・・・ ;

N	*****	Q1	A	**	M	******	A	**	M	******	・・・ ;

N	*****	Q1	A	**	I	******	A	**	I	******	・・・ ;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after A represents a controlled axis number (1 and up).
A numeric value after each of P, M, and I represents the value (real number) of a parameter for each controlled axis.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N01220Q1A1M50.0A2M60.0A3M70.0A4M0.0A5M0
.0 ....;

Parameter No.	1220	
Parameter value	1st axis:	50.0
	2nd axis:	60.0
	3rd axis:	70.0
	4th axis:	0.0
	5th axis:	0.0
		▪

3.3.17 Real Number Spindle Format

N	*****	Q1	S	**	P	******	S	**	P	******	· · · ;

N	*****	Q1	S	**	M	******	S	**	M	******	· · · ;

N	*****	Q1	S	**	I	******	S	**	I	******	· · · ;

A numeric value after N represents a parameter number.
Q1 indicates that the data is parameter data.
A numeric value after S represents a spindle number (1 and up).
A numeric value after each of P, M, and I represents the value (real number) of a parameter for each spindle.
A semicolon (;) marks the end of a block. (LF is used for the ISO code, and CR is used for the EIA code.)

Example

N05898Q1S1P30.0S2P30.0S3P0.0S4P0.0;

Parameter No.	5898	
Parameter value	1st spindle:	30.0
	2nd spindle:	30.0
	3rd spindle:	0.0
	4th spindle:	0.0

3.3.18 Start and End of a Record

A parameter record starts with "%" and ends with "%".

Example

```
%;          ..........................................Start of record
N00000Q1P00001100;
N00002Q1P00000000;
▪
▪
N09162Q1P00000000;
N09163Q1P00000000;
%           ..........................................End of record
```

When parameters and pitch error compensation data are included in a single file, the file starts with "%" and ends with "%".

4 DESCRIPTION OF PARAMETERS

4.1 DATA TYPE

Parameters are classified by data type as follows:

Data type	Valid data range	Remarks
Bit Bit machine group Bit path Bit axis Bit spindle	0 or 1	
Byte Byte machine group Byte path Byte axis Byte spindle	-128 to 127 0 to 255	Some parameters handle these types of data as unsigned data.
Word Word machine group Word path Word axis Word spindle	-32768 to 32767 0 to 65535	Some parameters handle these types of data as unsigned data.
2-word 2-word machine group 2-word path 2-word axis 2-word spindle	0 to ±999999999	Some parameters handle these types of data as unsigned data.
Real Real machine group Real path Real axis Real spindle	See the Standard Parameter Setting Tables.	

NOTE

1 Each of the parameters of the bit, bit machine group, bit path, bit axis, and bit spindle types consists of 8 bits for one data number (parameters with eight different meanings).
2 For machine group types, parameters corresponding to the maximum number of machine groups are present, so that independent data can be set for each machine group.
3 For path types, parameters corresponding to the maximum number of paths are present, so that independent data can be set for each path.
4 For axis types, parameters corresponding to the maximum number of control axes are present, so that independent data can be set for each control axis.
5 For spindle types, parameters corresponding to the maximum number of spindles are present, so that independent data can be set for each spindle axis.
6 The valid data range for each data type indicates a general range. The range varies according to the parameters. For the valid data range of a specific parameter, see the explanation of the parameter.

4.2 REPRESENTATION OF PARAMETERS

Parameters of the bit type, bit machine group type, bit path type, bit axis type, and bit spindle type

Data No.	#7	#6	#5	#4	#3	#2	#1	#0
0000				EIA	NCR	ISP	CTV	TVC

Data No. Data (Data #0 to #7 are bit positions.)

Parameters other than the bit-type parameters above

Data No.	Data
1023	Number of the servo axis for each axis

Data No. Data

NOTE

1 The bits left blank in 4. DESCRIPTION OF PARAMETERS and parameter numbers that appear on the display but are not found in the parameter list are reserved for future expansion. They must always be 0.

2 A parameter usable with only one path control type, namely, the lathe system (T series) or the machining center system (M series), is indicated using two rows as shown below. When a row is blank, the parameter is not usable with the corresponding series.

[Example 1]
Parameter HTG is a parameter common to the M and T series, but Parameters RTV and ROC are parameters valid only for the T series.

	#7	#6	#5	#4	#3	#2	#1	#0	
1403	RTV		HTG	ROC					T series
			HTG						M series

[Example 2]
The following parameter is provided only for the M series.

1411		T series
	Cutting feedrate	M series

3 When "to" is inserted between two parameter numbers, there are parameters with successive numbers between the two starting and ending parameter numbers, but those intermediate parameter numbers are omitted for convenience.

4 The lower-case letter "x" or "s" following the name of a bit-type parameter indicates the following:
- ”□□□x” : Bit axis type parameters
- ”○○○s” : Bit spindle type parameters

4.3 STANDARD PARAMETER SETTING TABLES

Overview

This section defines the standard minimum data units and valid data ranges of the CNC parameters of the real type, real machine group type, real path type, real axis type, and real spindle type. The data type and unit of data of each parameter conform to the specifications of each function.

Explanation

(A) Length and angle parameters (type 1)

Unit of data	Increment system	Minimum data unit	Valid data range
mm deg.	IS-A	0.01	-999999.99 to +999999.99
	IS-B	0.001	-999999.999 to +999999.999
	IS-C	0.0001	-99999.9999 to +99999.9999
	IS-D	0.00001	-9999.99999 to +9999.99999
	IS-E	0.000001	-999.999999 to +999.999999
inch	IS-A	0.001	-99999.999 to +99999.999
	IS-B	0.0001	-99999.9999 to +99999.9999
	IS-C	0.00001	-9999.99999 to +9999.99999
	IS-D	0.000001	-999.999999 to +999.999999
	IS-E	0.0000001	-99.9999999 to +99.9999999

(B) Length and angle parameters (type 2)

Unit of data	Increment system	Minimum data unit	Valid data range
mm deg.	IS-A	0.01	0.00 to +999999.99
	IS-B	0.001	0.000 to +999999.999
	IS-C	0.0001	0.0000 to +99999.9999
	IS-D	0.00001	0.00000 to +9999.99999
	IS-E	0.000001	0.000000 to +999.999999
inch	IS-A	0.001	0.000 to +99999.999
	IS-B	0.0001	0.0000 to +99999.9999
	IS-C	0.00001	0.00000 to +9999.99999
	IS-D	0.000001	0.000000 to +999.999999
	IS-E	0.0000001	0.0000000 to +99.9999999

(C) Velocity and angular velocity parameters

Unit of data	Increment system	Minimum data unit	Valid data range
mm/min degree/min	IS-A	0.01	0.0 to +999000.00
	IS-B	0.001	0.0 to +999000.000
	IS-C	0.0001	0.0 to +99999.9999
	IS-D	0.00001	0.0 to +9999.99999
	IS-E	0.000001	0.0 to +999.999999
inch/min	IS-A	0.001	0.0 to +96000.000
	IS-B	0.0001	0.0 to +9600.0000
	IS-C	0.00001	0.0 to +4000.00000
	IS-D	0.000001	0.0 to +400.000000
	IS-E	0.0000001	0.0 to +40.0000000

(D)Acceleration and angular acceleration parameters

Unit of data	Increment system	Minimum data unit	Valid data range
mm/sec^2 deg./sec^2	IS-A	0.01	0.00 to +999999.99
	IS-B	0.001	0.000 to +999999.999
	IS-C	0.0001	0.0000 to +99999.9999
	IS-D	0.00001	0.00000 to +9999.99999
	IS-E	0.000001	0.000000 to +999.999999
inch/sec^2	IS-A	0.001	0.000 to +99999.999
	IS-B	0.0001	0.0000 to +99999.9999
	IS-C	0.00001	0.00000 to +9999.99999
	IS-D	0.000001	0.000000 to +999.999999
	IS-E	0.0000001	0.0000000 to +99.9999999

Notes

(1) Values are rounded up or down to the nearest multiples of the minimum data unit.
(2) A valid data range means data input limits, and may differ from values representing actual performance.
(3) For information on the ranges of commands to the CNC, refer to Appendix, "List of Command Ranges," in the "USER'S MANUAL" (B-63944EN).

4.4 PARAMETERS OF SETTING

	#7	#6	#5	#4	#3	#2	#1	#0
0000			SEQ			INI	ISO	TVC

[Input type] Setting input
[Data type] Bit path

 # 0 TVC TV check
0: Not performed
1: Performed

 # 1 ISO Code used for data output
0: EIA code
1: ISO code

> **NOTE**
> ASCII code is used at all times for output to the memory card.

 # 2 INI Unit of input
0: In metrics
1: In inches

 # 5 SEQ Automatic insertion of sequence numbers
0: Not performed
1: Performed

	#7	#6	#5	#4	#3	#2	#1	#0
0001							FCV	

[Input type] Setting input
[Data type] Bit path

 # 1 FCV Program format
0: Series 16 standard format
1: Series 15 format

> **NOTE**
> 1 Programs created in the Series 15 program format can be used for operation on the following functions:
> 1 Subprogram call M98
> 2 Thread cutting with equal leads G32 (T series)
> 3 Canned cycle G90, G92, G94 (T series)
> 4 Multiple repetitive canned cycle G71 to G76 (T series)
> 5 Drilling canned cycle
> G83.1, G80 to G89 (T series)
> G73, G74, G76, G80 to G89(M series)
> 2 When the program format used in the Series 15 is used for this CNC, some limits may add. Refer to the User's Manual.

	#7	#6	#5	#4	#3	#2	#1	#0
0002	SJZ							

[Input type] Setting input
[Data type] Bit

 # 7 SJZ On an axis for which bit 3 (HJZx) of parameter No. 1005 is set:
0: If a reference position is not established yet, reference position return is performed with deceleration dogs.
If a reference position is already established, reference position return is performed at a parameter-set feedrate without using deceleration dogs.
1: Reference position return is performed with deceleration dogs at all times.

> **NOTE**
> SJZ is valid for an axis for which bit 3 (HJZx) of parameter No. 1005 is set to 1. When bit 1 (DLZx) of parameter No. 1005 is set to 1, however, manual reference position return after a reference position is set is performed at a parameter-set feedrate, regardless of the setting of SJZ.

	#7	#6	#5	#4	#3	#2	#1	#0
0010						PEC	PRM	PZS

[Input type] Setting input
[Data type] Bit path

 # 0 PZS When a part program is punched out, the O number is:
0: Not zero-suppressed.
1: Zero-suppressed.

 # 1 PRM When parameters are output, the parameters whose values are 0 are:
0: Output.
1: Not output.

 # 2 PEC When pitch error compensation data is output, the data whose value is 0 is:
0: Output.
1: Not output.

> **NOTE**
> This parameter is invalid for output of high-precision pitch error compensation data.

	#7	#6	#5	#4	#3	#2	#1	#0
0012	RMVx							MIRx

[Input type] Setting input
[Data type] Bit axis

 # 0 MIRx Mirror image for each axis
0: Mirror image is off. (Normal)
1: Mirror image is on. (Mirror)

 # 7 RMVx Releasing the assignment of the control axis for each axis
0: Not released
1: Released
(Equivalent to the control axis detachment signals DTCH1, DTCH2, and so forth)

> **NOTE**
> RMVx is valid when bit 7 (RMBx) of parameter No. 1005 is set to 1.

4.5 PARAMETERS OF READER/PUNCHER INTERFACE

To transfer data (programs, parameters, and so forth) to and from an external input/output device through the I/O device interface (RS-232-C serial interface), the parameters described below need to be set.

The input/output device connected to a channel (such as RS-232-C serial port 1 and RS-232-C serial port 2) can be selected by setting I/O CHANNEL (parameter No. 0020). The specifications (input/output specification number, baud rate, and the number of stop bits) of an input/output device connected to each channel must be set in the parameters corresponding to each channel beforehand.

For channel 1, two combinations of parameters to specify the input/output device data are provided.

The following shows the interrelation between the input/output device interface parameters for the channels.

0020	I/O CHANNEL or foreground input

Set channels to be used for data input/output.

I/O CHANNEL (0 to 5)
=0 : Channel 1
=1 : Channel 1
=2 : Channel 2
=3 : Channel 3
:
:
:

Input/output to and from the memory card interface, etc. is also possible.

When IO4 is set

0021	Foreground output
0022	Background input
0023	Background input

The channel setting is the same as No.0020.

Input/output channel number (parameter No.0020)

↓

I/O CHANNEL=0 (Channel 1)	0101	Stop bit and other data
	0102	Number specified for the input/output device
	0103	Baud rate
I/O CHANNEL=1 (Channel 1)	0111	Stop bit and other data
	0112	Number specified for the input/output device
	0113	Baud rate
I/O CHANNEL=2 (Channel 2)	0121	Stop bit and other data
	0122	Number specified for the input/output device
	0123	Baud rate

:
:
:

I/O CHANNEL=5

4.5.1 Parameters Common to all Channels

0020	**I/O CHANNEL : Input/output device selection, or interface number for a foreground input device**

0021	**Foreground output device setting**

0022	**Background input device setting**

0023	**Background output device setting**

[Input type] Setting input
[Data type] Byte
[Valid data range] 0 to 5

The CNC has the following interfaces for transferring data to and from an external input/output device and the host computer:

Input/output device interface (RS-232-C serial ports 1 and 2)
Memory card interface
Data server interface

By setting bit 0 (IO4) of parameter No. 0110, data input/output can be controlled separately. When IO4 is not set, data input/output is performed using the channel set in parameter No. 0020. When IO4 is set, a channel can be assigned to each of foreground input, foreground output, background input, and background output.

In these parameters, specify the interface connected to each input/output device to and from which data is to be transferred. See the table below for these settings.

Correspondence between settings and input/output devices	
Setting	**Description**
0,1	RS-232-C serial port 1
2	RS-232-C serial port 2
4	Memory card interface
5	Data server interface

0024	Setting of communication with the ladder development tool (FANUC LADDER-III, ladder editing package)

[Input type] Setting input
[Data type] Word
[Valid data range] 0 to 255

This parameter is used to enable or disable the PMC online connection function.

By specifying this parameter, the PMC online connection function can be enabled or disabled without displaying the PMC online setting screen.

Setting	RS-232-C	High-speed interface
0	The setting on the PMC online setting screen is not altered.	
1	To be used (channel 1)	Not to be used
2	To be used (channel 2)	Not to be used
10	Not to be used	To be used
11	To be used (channel 1)	To be used
12	To be used (channel 2)	To be used
255	Communication is terminated forcibly (as with the [FORCED STOP] soft key).	

NOTE

1 The setting of this parameter becomes valid when the power is turned on or this parameter is modified. After this parameter is set, the power need not be turned off then back on.

2 A setting modification made on the PMC online setting screen is not reflected in this parameter.

3 The communication settings of a baud rate and so forth for using RS-232-C made on the PMC online setting screen are valid. When no modification is ever made to the settings on the PMC online setting screen, the baud rate is 9600, parity is not used, and the number of stops bits is 2.

	#7	#6	#5	#4	#3	#2	#1	#0
0100	ENS	IOP			NCR	CRF	CTV	

[Input type] Setting input
[Data type] Bit

 # 1 CTV Character counting for TV check in the comment section of a program.
0: Performed
1: Not performed

 # 2 CRF Output of the end of block (EOB) in ISO code
0: Depends on the setting of bit 3 (NCR) of parameter No. 100.
1: CR, LF are output.

 # 3 NCR Output of the end of block (EOB) in ISO code
0: LF, CR, CR are output.
1: Only LF is output.

 # 6 IOP Stopping a program output or input operation by a reset is:
0: Enabled
1: Disabled
(Stopping a program input/output operation with the [STOP] soft key is enabled at all times.)

 # 7 ENS Action taken when a NULL code is found during read of EIA code
0: An alarm is generated.
1: The NULL code is ignored.

	#7	#6	#5	#4	#3	#2	#1	#0
0110								IO4

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 IO4 Separate control of I/O channel numbers is:
0: Not performed.
1: Performed.
If the I/O channels are not separately controlled, set the input/output device in parameter No. 20.
If the I/O channels are separately controlled, set the input device and output device in the foreground and the input device and output device in the background in parameters No. 20 to No. 23 respectively.
Separate control of I/O channels makes it possible to perform background editing, program input/output, and the like during the DNC operation.

	#7	#6	#5	#4	#3	#2	#1	#0
0138	MNC							

[Input type] Parameter input
[Data type] Bit

 # 7 MNC DNC operation from the memory card and external device subprogram call from the memory card are:
0: Not performed.
1: Performed.

4.5.2 Parameters of Channel 1 (I/O CHANNEL=0)

	#7	#6	#5	#4	#3	#2	#1	#0
0101	NFD				ASI			SB2

[Input type] Parameter input
[Data type] Bit

 # 0 SB2 The number of stop bits
0: 1
1: 2

 # 3 ASI Code used at data input
0: EIA or ISO code (automatically distinguished)
1: ASCII code

 # 7 NFD Feed before and after the data at data output
0: Output
1: Not output
When input/output devices other than the FANUC PPR are used, set NFD to 1.

0102	Number specified for the input/output device (when the I/O CHANNEL is set to 0)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 6
Set the specification number of the input/output device corresponding to I/O CHANNEL=0.

0103	Baud rate (when I/O CHNNEL is set to 0)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 1 to 12
Set the baud rate of the input/output device corresponding to I/O CHANNEL=0.

4.5.3 Parameters of Channel 1 (I/O CHANNEL=1)

	#7	#6	#5	#4	#3	#2	#1	#0
0111	NFD				ASI			SB2

[Input type] Parameter input
[Data type] Bit

 # 0 SB2 The number of stop bits
0: 1
1: 2

 # 3 ASI Code used at data input
0: EIA or ISO code (automatically distinguished)
1: ASCII code

 # 7 NFD Feed before and after the data at data output
0: Output
1: Not output

0112	Number specified for the input/output device (when the I/O CHANNEL is set to 1)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 6

Set the specification number of the input/output device corresponding to I/O CHANNEL=1.

0113	Baud rate (when I/O CHNNEL is set to 1)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 1 to 12

Set the baud rate of the input/output device corresponding to I/O CHANNEL=1.

4.5.4 Parameters of Channel 2 (I/O CHANNEL=2)

	#7	#6	#5	#4	#3	#2	#1	#0
0121	NFD				ASI			SB2

[Input type] Parameter input
[Data type] Bit

 # 0 SB2 The number of stop bits
0: 1
1: 2

 # 3 ASI Code used at data input
0: EIA or ISO code (automatically distinguished)
1: ASCII code

 # 7 NFD Feed before and after the data at data output
0: Output
1: Not output
When input/output devices other than the FANUC PPR are used, set NFD to 1.

0122	Number specified for the input/output device (when the I/O CHANNEL is set to 2)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 6
Set the specification number of the input/output device corresponding to I/O CHANNEL=2.

0123	Baud rate (when I/O CHNNEL is set to 2)

[Input type] Parameter input
[Data type] Byte
[Valid data range] 1 to 12
Set the baud rate of the input/output device corresponding to I/O CHANNEL=2.

4.6 PARAMETERS OF POWER MATE CNC

	#7	#6	#5	#4	#3	#2	#1	#0
0960				PPE	PMN	MD2	MD1	

[Input type] Parameter input
[Data type] Bit path

 # 1 MD1 The input/output destination of slave parameters is:
0: Program memory (when MD2 = 0)
1: Memory card (when MD2 = 0)

 # 2 MD2 The input/output destination of slave parameters is as follows:
0: Be sure to set MD2 to 0. (The destination is determined by MD1 and MD2.)
1: Reserved

Parameter MD2	Parameter MD1	I/O destination
0	0	Program memory
0	1	Memory card

 # 3 PMN The Power Mate CNC manager function is:
0: Enabled.
1: Disabled.
This parameter is used to place priority on commands from the ladder for each connected slave (to stop communication by the Power Mate CNC manager function) after completion of setting and confirmation of necessary data with each slave.

 # 4 PPE
0: The Power Mate CNC manager can set slave parameters at all times.
1: Slave parameter setting by the Power Mate CNC manager follows the setting of PWE for the host CNC. When PWE = 0, the setting of the I/O LINK β parameter is prohibited.

	#7	#6	#5	#4	#3	#2	#1	#0
0961					PMO			

[Input type] Parameter input
[Data type] Bit

 # 3 PMO The O number of a program for saving and restoring the I/O LINK β parameter is set based on:
0: Group number and channel number
1: Group number only

4.7 PARAMETERS OFSYSTEM CONFIGURATION

0980	Machine group number to which each path belongs

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 3
Set the machine group number to which each path belongs.

NOTE
When 0 is set, each path is assumed to belong to machine group 1.

0981	Absolute path number to which each axis belongs

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 1 to 10
Set the path to which each axis belongs.

NOTE
When 0 is set, each axis is assumed to belong to path 1.

0982	Absolute path number to which each spindle belongs

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 1 to 10
Set the path to which each spindle belongs.

NOTE
When 0 is set, each axis is assumed to belong to path 1.

0983	Path control type of each path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 1

Set the path control type of each path.
The following two path control types are available:
T series (lathe system) : 0
M series (machining system) : 1

	#7	#6	#5	#4	#3	#2	#1	#0
0984								LCP

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 LCP Set whether the path is a loader control path.
0: The path is not a loader control path.
1: The path is a loader control path.

4.8 PARAMETERS OF AXIS CONTROL/INCREMENT SYSTEM

	#7	#6	#5	#4	#3	#2	#1	#0
1000								EEA

[Input type] Parameter input
[Data type] Bit

 # 0 EEA An extended axis name and extended spindle name are:
0: Invalid
1: Valid

	#7	#6	#5	#4	#3	#2	#1	#0
1001								INM

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 INM Least command increment on the linear axis
0: In mm (metric system machine)
1: In inches (inch system machine)

	#7	#6	#5	#4	#3	#2	#1	#0
1002	IDG			XIK	AZR			JAX

[Input type] Parameter input
[Data type] Bit path

 # 0 JAX Number of axes controlled simultaneously in jog feed, manual rapid traverse and manual reference position return
0: 1 axis
1: 3 axes

 # 3 AZR When no reference position is set, the G28 command causes:
0: Reference position return using deceleration dogs (as during manual reference position return) to be executed.
1: Alarm (PS0304) "G28 was specified when no reference position is set" to be displayed.

> **NOTE**
> When reference position return without dogs is specified, (when bit 1 (DLZ) of parameter No.1002 is set to 1) the G28 command specified before a reference position is set causes an alarm PS0304 to be issued, regardless of the setting of AZR.

# 4	**XIK**	When LRP, bit 1 of parameter No.1401, is set to 0, namely, when positioning is performed using non-linear type positioning, if an interlock is applied to the machine along one of axes in positioning, 0: The machine stops moving along the axis for which the interlock is applied and continues to move along the other axes. 1: The machine stops moving along all the axes.
# 7	**IDG**	When the reference position is set without dogs, automatic setting of the IDGx parameter (bit 0 of parameter No.1012) to prevent the reference position from being set again is: 0: Not performed. 1: Performed.

NOTE

When this parameter is set to 0, bit 0 (IDGx) of parameter No. 1012 is invalid.

	#7	#6	#5	#4	#3	#2	#1	#0
1004	IPR							

[Input type] Parameter input
[Data type] Bit path

# 7	**IPR**	When a number with no decimal point is specified, the least input increment of each axis is: 0: Not 10 times greater than the least command increment 1: 10 times greater than the least command increment When the increment system is IS-A, and bit 0 (DPI) of parameter No. 3401 is set to 1 (fixed-point format), the least input increment cannot be 10 times greater than the least command increment.

	#7	#6	#5	#4	#3	#2	#1	#0
1005	RMBx	MCCx	EDMx	EDPx	HJZx		DLZx	ZRNx

[Input type] Parameter input
[Data type] Bit axis

 # 0 ZRNx If a move command other than G28 is specified by automatic operation when no reference position return is performed yet after the power is turned on:
0: The alarm (PS0224) "PERFORM REFERENCE POSITION RETURN." is issued.
1: Operation is performed without issuing an alarm.

> **NOTE**
> The state in which a reference position has not been established refers to the following state:
> - When an absolute position detector is not used and reference position return has not been performed even once after power-up
> - When an absolute position detector is used and the association of the machine position with the position detected with the absolute position detector has not been completed (See the description of bit 4 (APZx) of parameter No. 1815.)

 # 1 DLZx Function for setting the reference position without dogs
0: Disabled
1: Enabled

 # 3 HJZx When a reference position is already set:
0: Manual reference position return is performed with deceleration dogs.
1: Manual reference position return is performed using rapid traverse without deceleration dogs, or manual reference position return is performed with deceleration dogs, depending on the setting of bit 7 (SJZ) of parameter No.0002.

When the function for setting the reference position without dogs (see the description of bit 1 (DLZx) of parameter No. 1005) is used, manual reference position return after a reference position is set is always performed at a parameter-set feedrate, regardless of the setting of HJZ.

 # 4 EDPx In cutting feed, an external deceleration signal in the + direction for each axis is:
0: Invalid
1: Valid

 # 5 EDMx In cutting feed, an external deceleration signal in the - direction for each axis is:
0: Invalid

1: Valid

 # 6 MCCx If a multi-axis amplifier is used, and another axis of the same amplifier is placed in the control axis detach state, the MCC signal of the servo amplifier is:
0: Turned off.
1: Not turned off.

> **NOTE**
> 1 This parameter can be set for a control axis.
> 2 If the servo motor of an axis subject to control axis detachment is connected to a multi-axis amplifier such as 2-axis amplifier, and one axis is placed in the control axis detach state, servo alarm (SV0401) (V ready off) is issued on another axis. This alarm can be prevented by setting this parameter.

 # 7 RMBx The control axis detachment signal for each axis and the setting input RMV (bit 7 of parameter No. 0012) are:
0: Invalid
1: Valid

	#7	#6	#5	#4	#3	#2	#1	#0
1006			ZMIx		DIAx		ROSx	ROTx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

ROTx, ROSx Setting linear or rotation axis.

ROSx	ROTx	Meaning
0	0	Linear axis (1) Inch/metric conversion is done. (2) All coordinate values are linear axis type. (Is not rounded in 0 to 360°) (3) Stored pitch error compensation is linear axis type (Refer to parameter No.3624)
0	1	Rotation axis (A type) (1) Inch/metric conversion is not done. (2) Machine coordinate values are rounded in 0 to 360_. Absolute coordinate values are rounded or not rounded by parameter No.1008#0(ROAx) and #2(RRLx). (3) Stored pitch error compensation is the rotation type. (Refer to parameter No.3624) (4) Automatic reference position return (G28, G30) is done in the reference position return direction and the move amount does not exceed one rotation.
1	1	Rotation axis (B type) (1) Inch/metric conversion, absolute coordinate values and relative coordinate values are not done. (2) Machine coordinate values, absolute coordinate values and relative coordinate values are linear axis type. (Is not rounded in 0 to 360°). (3) Stored pitch error compensation is linear axis type (Refer to parameter No.3624) (4) Cannot be used with the rotation axis roll over function and the index table indexing function (M series)
Except for the above.		Setting is invalid (unused)

 # 3 DIAx The move command for each axis is based on:
0: Radius specification

1: Diameter specification

 # 5 ZMIx The direction of manual reference position return is:
0: + direction
1: - direction

	#7	#6	#5	#4	#3	#2	#1	#0
1007			G90x	GRDx	RAAx		ALZx	RTLx

[Input type] Parameter input
[Data type] Bit axis

 # 0 RTLx When manual reference position return is performed on a rotation axis (A type) with the deceleration dog pressed before a reference position is established:
0: A movement is made at the reference position return feedrate FL.
1: Until a servo motor grid is established, a movement is not made at the reference position return feedrate FL even if the deceleration dog is pressed, but a movement is made at the rapid traverse rate.

If the deceleration dog is released after a movement at the rapid traverse rate and the deceleration dog is then pressed again and released after the rotation axis makes one revolution, reference position return operation is completed.
When this parameter is set to 0, the alarm (SW0090) "REFERENCE POSITION RETURN FAILURE" is issued if the deceleration dog is released before a servo motor grid is established.
If this alarm is issued, start manual reference position return at a position sufficiently far away from the reference position.

 # 1 ALZx In automatic reference position return (G28):
0: Reference position return is performed by positioning (rapid traverse).
If no reference position return is performed after the power is turned on, however, reference position return is performed using the same sequence as for manual reference position return.
1: Reference position return is performed using the same sequence as for manual reference position return.

 # 3 RAAx Rotary axis control is:
0: Not exercised.
1: Exercised.
When an absolute command is specified, the rotary axis control function determines the direction of rotation from the sign of the command value and determines an end coordinate from the absolute value of the command value.

NOTE
RAA is valid when bit 0 (ROA) of parameter No. 1008 is set to 1 and bit 1 (RAB) of parameter No. 1008 is set to 0.
To use this function, the option for rotary axis control is required.

 # 4 GRDx For the axis on which absolute values are detected, when correspondence between the machine position and the position by the absolute position detector is not completed, setting of the reference position without dogs is:
0: Not performed two or more times.
1: Performed two or more times.

 # 5 G90x A command for a rotary controlled axis is:
0: Regarded as an absolute/incremental command according to the G90/G91 mode setting.
1: Regarded as an absolute command at all times.

	#7	#6	#5	#4	#3	#2	#1	#0
1008			RMCx	SFDx		RRLx	RABx	ROAx

[Input type] Parameter input
[Data type] Bit axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 ROAx The roll-over function of a rotation axis is
0: Invalid
1: Valid

NOTE
ROAx specifies the function only for a rotation axis (for which ROTx, #0 of parameter No.1006, is set to 1)

 # 1 RABx In the absolute commands, the axis rotates in the direction
0: In which the distance to the target is shorter.
1: Specified by the sign of command value.

NOTE
RABx is valid only when ROAx is 1.

 # 2 RRLx Relative coordinates are
0: Not rounded by the amount of the shift per one rotation
1: Rounded by the amount of the shift per one rotation

NOTE
1 RRLx is valid only when ROAx is 1.
2 Assign the amount of the shift per one rotation in parameter No.1260.

 # 4 SFDx In reference position return based on the grid method, the reference position shift function is:
0: Disabled
1: Enabled

 # 5 RMCx When machine coordinate system selection (G53) is specified, bit 1 (RABx) of parameter No. 1008 for determining the rotation direction of an absolute command for the roll-over function of a rotation axis, and bit 3 (RAAx) of parameter No. 1007 for rotary axis control are:
0: Invalid
1: Valid

	#7	#6	#5	#4	#3	#2	#1	#0
1012								IDGx

[Input type] Parameter input
[Data type] Bit axis

 # 0 IDGx The function for setting the reference position again, without dogs, is:
0: Not inhibited.
1: Inhibited.
(The alarm (PS0301) is issued.)

NOTE

IDGx is enabled when the IDG parameter (bit 7 of parameter No.1002) is 1.
If the function for setting the reference position without dogs is used, and the reference position is lost in absolute position detection for a cause, the alarm (DS0300) is issued when the power is turned on again.
If the operator performs reference position return, as a result of mistakenly identifying the alarm as that requesting the operator to perform a normal reference position return, an invalid reference position may be set. To prevent such an operator error, the IDGx parameter is provided to prevent the reference position from being set again without dogs.

(1) If the IDG parameter (bit 7 of parameter No.1002) is set to 1, the IDGx parameter (bit 0 of parameter No.1012) is automatically set to 1 when the reference position is set using the function for setting the reference position without dogs. This prevents the reference position from being set again without dogs.
(2) Once the reference position is prevented from being set for an axis again, without dogs, any attempt to set the reference position for the axis without dogs results in the output of an alarm (PS0301).
(3) When the reference position must be set again without dogs, set IDGx (bit 0 of parameter No.1012) to 0 before setting the reference position.

	#7	#6	#5	#4	#3	#2	#1	#0
1013					ISEx	ISDx	ISCx	ISAx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 ISA
 # 1 ISC
 # 2 ISD
 # 3 ISE Increment system of each axis

Increment system	#3 ISE	#2 ISD	#1 ISC	#0 ISA
IS-A	0	0	0	1
IS-B	0	0	0	0
IS-C	0	0	1	0
IS-D	0	1	0	0
IS-E	1	0	0	0

	#7	#6	#5	#4	#3	#2	#1	#0
1014	CDMx							

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 7 CDMx The Cs contour control axis is:
0: Not a virtual Cs axis
1: Virtual Cs axis

	#7	#6	#5	#4	#3	#2	#1	#0
1015	DWT			ZRL				

[Input type] Parameter input
[Data type] Bit path

 # 4 ZRL When a reference position is established, the tool path from the middle point to the reference position and machine coordinate positioning (G53) in automatic reference position return (G28) are based on:
0: Positioning of nonlinear interpolation type
1: Positioning of linear interpolation type

> **NOTE**
> This parameter is valid when bit 1 (LRP) of parameter No. 1401 is set to 1.

 # 7 **DWT** When time for dwell per second is specified by P, the increment system:
0: Depends on the increment system
1: Does not depend on the increment system (1 ms)

1020	Program axis name for each axis

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 67,85 to 90

An axis name (axis name 1: parameter No. 1020) can be arbitrarily selected from 'A', 'B', 'C', 'U', 'V', 'W', 'X', 'Y', and 'Z'. (When G code system A is used with the lathe system, however, 'U', 'V', and 'W' are not selectable.) When bit 0 (EEA) of parameter No. 1000 is set to 1, the length of an axis name can be extended to three characters by setting axis name 2 (parameter No. 1025) and axis name 3 (parameter No. 1026) (extended axis name).
For axis names 2 and 3, a character from '0' to '9' and 'A' to 'Z' of ASCII code can be arbitrarily selected. However, the setting of axis name 3 for each axis is invalid if axis name 2 is not set. Moreover, if a character from '0' to '9' is set as axis name 2, do not use a character from 'A' to 'Z' as axis name 3.

(Tip) ASCII code

Axis name	X	Y	Z	A	B	C	U	V	W
Setting	88	89	90	65	66	67	85	86	87

When G code system A is used with the lathe system, and the character 'X','Y','Z', or 'C' is used as axis name 1 of an axis, a command with 'U','V','W', or 'H' specified for axis name 1 represents an incremental command for the axis.

NOTE
1. When a multiple repetitive canned cycle for turning is used, no character other than 'X','Y', and 'Z' can be used as the address of the axis.
2. When the custom macro function is enabled, the same extended axis name as a reserved word cannot be used. Such an extended axis name is regarded as a reserved word.
3. In a macro call, no extended axis name can be used as an argument.

1022	Setting of each axis in the basic coordinate system

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 7

To determine a plane for circular interpolation, cutter compensation, and so forth (G17: Xp-Yp plane, G18: Zp-Xp plane, G19: Yp-Zp plane) and a three-dimensional tool compensation space (XpYpZp), specify which of the basic three axes (X, Y, and Z) is used for each control axis, or a parallel axis of which basic axis is used for each control axis.

A basic axis (X, Y, or Z) can be specified only for one control axis.

Two or more control axes can be set as parallel axes for the same basic axis.

Setting	Meaning
0	Rotation axis (Neither the basic three axes nor a parallel axis)
1	X axis of the basic three axes
2	Y axis of the basic three axes
3	Z axis of the basic three axes
5	Axis parallel to the X axis
6	Axis parallel to the Y axis
7	Axis parallel to the Z axis

In general, the increment system and diameter/radius specification of an axis set as a parallel axis are to be set in the same way as for the basic three axes.

1023	Number of the servo axis for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to Number of controlled axes

Set the servo axis for each control axis.
Usually set to same number as the control axis number.
The control axis number is the order number that is used for setting the axis-type parameters or axis-type machine signals

* With an axis for which Cs contour control/spindle positioning is to be performed, set -(spindle number) as the servo axis number.
  Example)
  When exercising Cs contour control on the fourth controlled axis by using the first spindle, set -1.
* For tandem controlled axes or electronic gear box (EGB) controlled axes, two axes need to be specified as one pair. So, make a setting as described below.
  Tandem axis:
  For a master axis, set an odd (1, 3, 5, 7, ...) servo axis number. For a slave axis to be paired, set a value obtained by adding 1 to the value set for the master axis.
  EGB axis:
  For a slave axis, set an odd (1, 3, 5, 7, ...) servo axis number. For a dummy axis to be paired, set a value obtained by adding 1 to the value set for the slave axis.

1025	Program axis name 2 for each axis

1026	Program axis name 3 for each axis

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 48 to 57, 65 to 90

When axis name extension is enabled (when bit 0 (EEA) of parameter No. 1000 is set to 1), the length of an axis name can be extended to a maximum of three characters by setting axis name 2 and axis name 3.

> **NOTE**
> If program axis name 2 is not set, program axis name 3 is invalid.

1031	Reference axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

The unit of some parameters common to all axes such as those for dry run feedrate and single-digit F1 feedrate may vary according to the increment system. An increment system can be selected by a parameter on an axis-by-axis basis. So, the unit of those parameters is to match the increment system of a reference axis. Set which axis to use as a reference axis.

Among the basic three axes, the axis with the finest increment system is generally selected as a reference axis.

4.9 PARAMETERS OF COORDINATES

	#7	#6	#5	#4	#3	#2	#1	#0
1201	WZR	NWS			FPC	ZCL		ZPR
	WZR				FPC	ZCL		ZPR

[Input type] Parameter input
[Data type] Bit path

 # 0 ZPR Automatic setting of a coordinate system when the manual reference position return is performed
0: Not set automatically
1: Set automatically

> **NOTE**
> ZPR is valid while a workpiece coordinate system function is not provided. If a workpiece coordinate system function is provided, making a manual reference position return always causes the workpiece coordinate system to be established on the basis of the workpiece zero point offset (parameters No. 1220 to No. 1226), irrespective of this parameter setting.

 # 2 ZCL Local coordinate system when the manual reference position return is performed
0: The local coordinate system is not canceled.
1: The local coordinate system is canceled.

> **NOTE**
> ZCL is valid when the workpiece coordinate system option is specified. In order to use the local coordinate system (G52), the workpiece coordinate system option is required.

 # 3 FPC When a floating reference position is set with a soft key, the relative position indication is:
0: Not preset to 0 (The relative position indication remains unchanged.)
1: Preset to 0.

 # 6 NWS The workpiece coordinate system shift amount setting screen is:
0: Displayed
1: Not displayed

> **NOTE**
> When the workpiece coordinate shift amount setting screen is not displayed, a workpiece coordinate system shift amount modification using G10P0 cannot be made.

 # 7 WZR If the CNC is reset by the reset key on the MDI panel, external reset signal, reset and rewind signal, or emergency stop signal when bit 6 (CLR) of parameter No. 3402 is set to 0, the G code of group number 14 (workpiece coordinate system) is:

0: Placed in the reset state
1: Not placed in the reset state

> **NOTE**
> 1 When the three-dimensional conversion mode is set, and bit 2 (D3R) of parameter No. 5400 is set to 1, the G code is placed in the reset state, regardless of the setting of this parameter.
> 2 When bit 6 (CLR) of parameter No. 3402 is set to 1, whether to place the G code in the reset state depends on bit 6 (C14) of parameter No. 3407.

	#7	#6	#5	#4	#3	#2	#1	#0
1202					RLC	G92	EWS	EWD
					RLC	G92		EWD

[Input type] Parameter input
[Data type] Bit path

 # 0 EWD The shift direction of the workpiece coordinate system is:

0: The direction specified by the external workpiece zero point offset value
1: In the opposite direction to that specified by the external workpiece zero point offset value

 # 1 EWS The external workpiece zero point offset is made:

0: Valid
1: Invalid

NOTE

When the external workpiece zero point offset is made invalid, the following operation results:

1. As the external workpiece zero point offset on the workpiece zero point offset setting screen, a workpiece coordinate system shift amount is displayed.
2. Data keyed through the MDI panel for the workpiece coordinate system shift amount and external workpiece zero point offset is loaded into the memory for the workpiece coordinate system shift amount.
3. A write to or read from the workpiece coordinate system shift amount and external workpiece zero point offset with a macro variable is performed using the respective memory.
4. A write to or read from the workpiece coordinate system shift amount and external workpiece zero point offset with the window function is performed using the respective memory.

 # 2 G92 When the CNC has commands G52 to G59 specifying workpiece coordinate systems (optional function), if the G command for setting a coordinate system (G92 for M series, G50 for T series (or the G92 command in G command system B or C)) is specified,

0: G command is executed and no alarm is issued.

1: G command is not executed and an alarm (PS0010) is issued.

 # 3 RLC Local coordinate system is

0: Not cancelled by reset

1: Cancelled by reset

NOTE

1. When bit 6 (CLR) of parameter No. 3402 is set to 0, and bit 7 (WZR) of parameter No. 1201 is set to 1, the local coordinate system is cancelled, regardless of the setting of this parameter.
2. When bit 6 (CLR) of parameter No. 3402 is set to 1, and bit 6 (C14) of parameter No. 3407 is set to 0, the local coordinate system is cancelled, regardless of the setting of this parameter.
3. When the three-dimensional coordinate conversion mode is set, and bit 2 (D3R) of parameter No. 5400 is set to 1, the local coordinate system is not cancelled, regardless of the setting of this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
1203								EMS

[Input type] Parameter input
[Data type] Bit path

 # 0 EMS The extended external machine zero point shift function is:
0: Disabled.
1: Enabled.

> **NOTE**
> 1 To use the extended external machine zero point shift function, the external machine zero point shift function or the external data input function is required.
> 2 When the extended external machine zero point shift function is enabled, the conventional external machine zero point shift function is disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
1205			R2O	R1O				

[Input type] Parameter input
[Data type] Bit path

 # 4 R1O The output of the signal for the reference position is:
0: Disabled.
1: Enabled.

 # 5 R2O The output of the signal for the second reference position is:
0: Disabled.
1: Enabled.

1220	External workpiece zero point offset value in each axis

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This is one of the parameters that give the position of the zero point of workpiece coordinate system (G54 to G59). It gives an offset of the workpiece zero point common to all workpiece coordinate systems. In general, the offset varies depending on the workpiece coordinate systems. The value can be set from the PMC using the external data input function.

1221	**Workpiece zero point offset value in workpiece coordinate system 1 (G54)**
1222	**Workpiece zero point offset value in workpiece coordinate system 2(G55)**
1223	**Workpiece zero point offset value in workpiece coordinate system 3(G56)**
1224	**Workpiece zero point offset value in workpiece coordinate system 4 (G57)**
1225	**Workpiece zero point offset value in workpiece coordinate system 5 (G58)**
1226	**Workpiece zero point offset value in workpiece coordinate system 6 (G59)**

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

The workpiece zero point offset values in workpiece coordinate systems 1 to 6 (G54 to G59) are set.

1240	**Coordinate value of the reference position in the machine coordinate system**

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the coordinate values of the reference position in the machine coordinate system.

1241	Coordinate value of the second reference position in the machine coordinate system

1242	Coordinate value of the third reference position in the machine coordinate system

1243	Coordinate value of the fourth reference position in the machine coordinate system

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the coordinate values of the second to fourth reference positions in the machine coordinate system.

1244	Coordinate value of the floating reference position in the machine coordinate system

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the coordinate values of the floating reference position in the machine coordinate system.

1250	Coordinate system of the reference position used when automatic coordinate system setting is performed

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the coordinate system of the reference position on each axis to be used for setting a coordinate system automatically.

1260	Amount of a shift per one rotation of a rotation axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

Set the amount of a shift per one rotation of a rotation axis.
For the rotation axis used for cylindrical interpolation, set the standard value.

1280	Start address of signals used with the extended external machine zero point shift function

[Input type] Parameter input
[Data type] Word path
[Valid data range] Even number from 0 to 32767

Set the start address of signals used with the extended external machine zero point shift function. If a nonexistent address value is specified, this function is disabled.
If 100 is set, for example, this function uses R100 and up. The last R address to be used depends on the number of controlled axes. When eight controlled axes are used, R100 to R115 are used.

> **NOTE**
> If a nonexistent R address or an address in the system area is set, this function is disabled.

1290	Distance between two opposite tool posts in mirror image

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

Set the distance between two opposite tool posts in mirror image.

4.10 PARAMETERS OF STORED STROKE CHECK

	#7	#6	#5	#4	#3	#2	#1	#0
1300	BFA		RL3			LMS	NAL	OUT

[Input type] Setting input
[Data type] Bit path

 # 0 OUT The area inside or outside of the stored stroke check 2 is set as an inhibition area
0: Inside
1: Outside

 # 1 NAL When the tool enters the inhibition area of stored stroke limit 1:
0: The overtravel alarm signal is not output.
1: The overtravel alarm signal is output, and the tool is decelerated to a stop.
If manual operation is in progress at this time, the alarm is not output.

> **NOTE**
> When this parameter is set to 1, the alarm is issued if the tool enters stored stroke limit 1 during automatic operation.

 # 2 LMS The EXLM signal for switching stored stroke check
0: Disabled
1: Enabled
When bit 0 (DLM) of parameter No. 1301 is set to 1, the stored stroke check 1 switch signal EXLM (G007#6) is made invalid.

 # 5 RL3 Stored stroke check 3 release signal RLSOT3 is
0: Disabled
1: Enabled

 # 7 BFA When the stored stroke check 1, 2, or 3 alarm is issued, an interference alarm is issued with the inter-path interference check function (T series), or a chuck/tail stock barrier (T series) alarm is issued:
0: The tool stops after entering the prohibited area.
1: The tool stops before the prohibited area.

	#7	#6	#5	#4	#3	#2	#1	#0
1301	PLC	OTS				NPC		DLM

[Input type] Setting input
[Data type] Bit path

 # 0 DLM The stored stroke limit switching signals +EXLx and -EXLx for each axial direction are:
0: Disabled.
1: Enabled.
When this parameter is set to 1, the stored stroke check 1 switch signal EXLM (G007#6) is made invalid.

 # 2 NPC As part of the stroke limit check performed before movement, the movement specified in G31 (skip) and G37 (automatic tool length measurement) blocks is:
0: Checked
1: Not checked

> **NOTE**
> This parameter is valid only when the option for stroke check before movement is selected.

 # 6 OTS When the overtravel alarm is issued:
0: The overtravel alarm signal is not output to the PMC.
1: The overtravel alarm signal is output to the PMC.

 # 7 PLC Stroke check before movement is:
0: Not performed
1: Performed

> **NOTE**
> This parameter is valid only when the option for stroke check before movement is selected.

	#7	#6	#5	#4	#3	#2	#1	#0
1310							OT3x	OT2x

[Input type] Setting input
[Data type] Bit axis

 # 0 OT2x Stored stroke check 2 for each axis is :
0: Disabled
1: Enabled

 # 1 OT3x Stored stroke check 3 for each axis is :
0: Disabled
1: Enabled

1320	Coordinate value I of stored stroke check 1 in the positive direction on each axis

1321	Coordinate value I of stored stroke check 1 in the negative direction on each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate value of stored stroke check 1 on each axis in the + or - direction in the machine coordinate system.

NOTE
1 Specify diameter values for any axes for which diameter programming is specified.
2 The area outside the area set by parameter No. 1320 and No. 1321 is a prohibited area.

1322	Coordinate value I of stored stroke check 2 in the positive direction on each axis

1323	Coordinate value I of stored stroke check 2 in the negative direction on each axis

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the coordinate value of stored stroke check 2 on each axis in the + or - direction in the machine coordinate system.

NOTE
1 Specify diameter values for any axes for which diameter programming is specified.
2 Whether the inside area or outside area is a prohibited area is set using bit 0 (OUT) of parameter No. 1300.

1324	Coordinate value I of stored stroke check 3 in the positive direction on each axis

1325	Coordinate value I of stored stroke check 3 in the negative direction on each axis

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the coordinate value of stored stroke check 3 on each axis in the + or - direction in the machine coordinate system.

> **NOTE**
> 1 Specify diameter values for any axes for which diameter programming is specified.
> 2 The area inside the area set by parameter No. 1324 and No. 1325 is a prohibited area.

1326	Coordinate value II of stored stroke check 1 in the negative direction on each axis

1327	Coordinate value II of stored stroke check 1 in the negative direction on each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the coordinate value of stored stroke check 1 on each axis in the + or - direction in the machine coordinate system.

When the stored stroke check switch signal EXLM is set to 1, or the stored stroke check switch signal for each axis direction +EXLx is set to 1, parameter No. 1326 and No. 1327 are used for stroke check instead of parameter No.1320 and No. 1321.

> **NOTE**
> 1 Specify diameter values for any axes for which diameter programming is specified.
> 2 The area outside the area set by parameter No. 1326 and No. 1327 is a prohibited area.
> 3 The EXLM signal is valid only when bit 2 (LMS) of parameter No. 1300 is set to 1.
> 4 The +EXLx signal is valid only when bit 0 (DLM) of parameter No. 1301 is set to 1.

4.11 PARAMETERS OF THE CHUCK AND TAIL STOCK BARRIER

1330	Profile of a chuck

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 1

Select a chuck figure.
0 : Chuck which holds a workpiece on the inner surface
1 : Chuck which holds a workpiece on the outer surface

1331	Dimensions of the claw of a chuck (L)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

Set the length (L) of the claw of the chuck.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1332	Dimensions of the claw of a chuck (W)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

Set the width (W) of the claw of the chuck.

> **NOTE**
> Specify this parameter by using a radius value at all times.

1333	Dimensions of the part of a claw at which a workpiece is held (L1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the length (L1) of the claw of the chuck.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1334	Dimensions of the part of a claw at which a workpiece is held (W1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the width (W1) of the claw of the chuck.

> **NOTE**
> Specify this parameter by using a radius value at all times.

1335	X coordinate of a chuck (CX)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the chuck position (X coordinate) in the workpiece coordinate system.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1336	Z coordinate of a chuck (CZ)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
Set the chuck position (Z coordinate) in the workpiece coordinate system.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1341	Length of a tail stock (L)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the length (L) of the tail stock.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1342	Diameter of a tail stock (D)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the diameter (D) of the tail stock.

> **NOTE**
> Specify this parameter by using a diameter value at all times.

1343	Length of a tail stock (L1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the length (L1) of the tail stock.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1344	Diameter of a tail stock (D1)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the diameter (D1) of the tail stock.

> **NOTE**
> Specify this parameter by using a diameter value at all times.

1345	Length of a tail stock (L2)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the length (L2) of the tail stock.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

1346	Diameter of a tail stock (D2)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the diameter (D2) of the tail stock.

> **NOTE**
> Specify this parameter by using a diameter value at all times.

1347	Diameter of the hole of a tail stock (D3)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
Set the diameter (D3) of the tail stock.

> **NOTE**
> Specify this parameter by using a diameter value at all times.

1348	Z coordinate of a tail stock (TZ)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the tail stock position (Z coordinate) in the workpiece coordinate system.

> **NOTE**
> Whether to specify this parameter by using a diameter value or radius value depends on whether the corresponding axis is based on diameter specification or radius specification.

4.12 PARAMETERS OF FEEDRATE

	#7	#6	#5	#4	#3	#2	#1	#0
1401		RDR	TDR	RF0		JZR	LRP	RPD

[Input type] Parameter input
[Data type] Bit path

 # 0 RPD Manual rapid traverse during the period from power-on time to the completion of the reference position return.
0: Disabled (Jog feed is performed.)
1: Enabled

 # 1 LRP Positioning (G00)
0: Positioning is performed with non-linear type positioning so that the tool moves along each axis independently at rapid traverse.
1: Positioning is performed with linear interpolation so that the tool moves in a straight line.

When using three-dimensional coordinate conversion, set this parameter to 1.

 # 2 JZR The manual reference position return at JOG feedrate
0: Not performed
1: Performed

 # 4 RF0 When cutting feedrate override is 0% during rapid traverse,
0: The machine tool does not stop moving.
1: The machine tool stops moving.

 # 5 TDR Dry run during threading or tapping (tapping cycle G74 or G84, rigid tapping)
0: Enabled
1: Disabled

 # 6 RDR Dry run for rapid traverse command
0: Disabled
1: Enabled

	#7	#6	#5	#4	#3	#2	#1	#0
1402				JRV	OV2		JOV	NPC

[Input type] Parameter input
[Data type] Bit path

 # 0 NPC Feed per revolution without the position coder (function for converting feed per revolution F to feed per minute F in the feed per revolution mode (G95)) is:
0: Not used
1: Used

 # 1 JOV Jog override is:
0: Enabled
1: Disabled (tied to 100%)

 # 3 OV2 Signals used for 2nd feedrate override are
0: *AFV0 to AFV7 <G013> (specified every 1%)
1: *APF00 to *APF15 <G094, G095> (specified every 0.01%)

 # 4 JRV Jog feed or incremental feed is
0: Performed at feed per minute.
1: Performed at feed per rotation.

> **NOTE**
> 1 Specify a feedrate in parameter No.1423.
> 2 For the machining center system, the option for threading/synchronous feed is required.

	#7	#6	#5	#4	#3	#2	#1	#0
1403	RTV		HTG	ROC				
			HTG					

[Input type] Parameter input
[Data type] Bit path

 # 4 ROC In the threading cycles G92 and G76, rapid traverse override for retraction after threading is finished is:
0: Effective
1: Not effective (Override of 100%)

 # 5 HTG The feedrate for helical interpolation/helical involute interpolation/three-dimensional circular interpolation is:
0: Specified using the feedrate along the tangent to an arc/involute curve/three-dimensional arc
1: Specified using the feedrate along axes including a linear axis (specified axes other than the circular interpolation axis in the case of three-dimensional circular interpolation)

 # 7 RTV Rapid traverse override while the tool is retracting in threading
0: Rapid traverse override is effective.
1: Rapid traverse override is not effective.

	#7	#6	#5	#4	#3	#2	#1	#0
1404						FM3	DLF	
							DLF	

[Input type] Parameter input
[Data type] Bit path

 # 1 DLF After a reference position is set, manual reference position return performed at:
0: Rapid traverse rate (parameter No.1420)
1: Manual rapid traverse rate (parameter No.1424)

> **NOTE**
> This parameter selects a feedrate for reference position return performed without dogs. This parameter also selects a feedrate when manual reference position return is performed according to bit 7 (SJZ) of parameter No.0002 using rapid traverse without deceleration dogs after a reference position is set.

 # 2 FM3 The increment system of an F command without a decimal point in feed per minute is:
0: 1 mm/min (0.01 inch/min for inch input)
1: 0.001 mm/min (0.00001 inch/min for inch input)

	#7	#6	#5	#4	#3	#2	#1	#0
1405			EDR			PCL		
			EDR			PCL	FR3	

[Input type] Parameter input
[Data type] Bit path

 # 1 FR3 The increment system of an F command without a decimal point in feed per revolution is:
0: 0.01 mm/rev (0.0001 inch/rev for inch input)
1: 0.001 mm/rev (0.00001 inch/rev for inch input)

 # 2 PCL The function for constant surface speed control without the position coder is:
0: Not used.
1: Used.

> **NOTE**
> The option for constant surface speed control without the position coder is required.

 # 5 EDR As the external deceleration rate for positioning of linear interpolation type:

0: The external deceleration rate for cutting feed is used.
1: The external deceleration rate for the first axis in rapid traverse is used.

Let us use external deceleration 1 as an example.
When this parameter bit is set to 0, the value of parameter No. 1426 is used as the external deceleration rate for external deceleration 1.
When this parameter bit is set to 1, the value of axis 1 of parameter No. 1427 is used as the external deceleration rate for external deceleration 1.

	#7	#6	#5	#4	#3	#2	#1	#0
1406							EX3	EX2

[Input type] Parameter input
[Data type] Bit path

 # 0 EX2 External deceleration function setting 2 is:

0: Invalid
1: Valid

 # 1 EX3 External deceleration function setting 3 is:

0: Invalid
1: Valid

	#7	#6	#5	#4	#3	#2	#1	#0
1408								RFDx

[Input type] Parameter input
[Data type] Bit axis

 # 0 RFDx Feedrate control on a rotation axis is exercised using:

0: Conventional method
1: Method that specifies a feedrate on the virtual circle of the rotation axis

1410	Dry run rate

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Set the dry run rate at the 100% position on the jog feedrate specification dial. The unit of data depends on the increment system of the reference axis.

1411	
	Cutting feedrate

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Setting input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

When the machine requires little change in cutting feedrate during cutting, a cutting feedrate can be specified in the parameter. This eliminates the need to specify a cutting feedrate (F command) in the NC program.

1414	
	Feedrate for retrace

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Set a cutting feedrate for retrace operation. When 0 is set, a retrace operation is performed at a programmed feedrate.

1420	Rapid traverse rate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Set the rapid traverse rate when the rapid traverse override is 100% for each axis.

1421	F0 rate of rapid traverse override for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Set the F0 rate of the rapid traverse override for each axis.

1423	Feedrate in manual continuous feed (jog feed) for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

(1) When JRV, bit 4 of parameter No.1402, is set to 0 (feed per minute), specify a jog feedrate (feed per minute) under an override of 100%.
(2) When JRV, bit 4 of parameter No.1402, is set to 1 (feed per revolution), specify a jog feedrate (feed per revolution) under an override of 100%.

NOTE
This parameter is clamped to the axis-by-axis manual rapid traverse rate (parameter No. 1424).

1424	Manual rapid traverse rate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Set the rate of manual rapid traverse when the rapid traverse override is 100% for each axis.

NOTE
1 If 0 is set, the rate set in parameter 1420 (rapid traverse rate for each axis) is assumed.
2 When manual rapid traverse is selected (bit 0 (RPD) of parameter No. 1401 is set to 1), manual feed is performed at the feedrate set in this parameter, regardless of the setting of bit 4 (JRV) of parameter No. 1402.

1425	FL rate of the reference position return for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Set feedrate (FL rate) after deceleration when the reference position return is performed for each axis.

1426	External deceleration rate of cutting feed

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Set an external deceleration rate for cutting feed or positioning of linear interpolation type (G00).

1427	External deceleration rate of rapid traverse for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Set the external deceleration rate of rapid traverse for each axis.

1428	Reference position return feedrate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets a rapid traverse rate for reference position return operation using deceleration dogs, or for reference position return operation before a reference position is set.

This parameter is also used to set a feedrate for the rapid traverse command (G00) in automatic operation before a reference position is set.

NOTE

1 To this feedrate setting (100%), a rapid traverse override (F0, 25, 50, or 100%) is applicable.
2 For automatic return after completion of reference position return and machine coordinate system establishment, the normal rapid traverse rate is used.
3 As a manual rapid traverse rate before machine coordinate system establishment by reference position return, the jog feedrate or manual rapid traverse rate can be selected with bit 0 (RPD) of parameter No. 1401.

	Before coordinate system establishment	**After coordinate system establishment**
Automatic reference position return (G28)	No.1428	No.1420
Automatic rapid traverse (G00)	No.1428	No.1420
Manual reference position return *1	No.1428	No.1428 *3
Manual rapid traverse	No.1423 *2	No.1424

4 When parameter No. 1428 is set to 0, the following parameter-set feedrates are applied.

	Before coordinate system establishment	**After coordinate system establishment**
Automatic reference position return (G28)	No.1420	No.1420
Automatic rapid traverse (G00)	No.1420	No.1420
Manual reference position return *1	No.1424	No.1424 *3
Manual rapid traverse	No.1423 *2	No.1424

1420: rapid traverse rate
1423: Jog feedrate
1424: Manual rapid traverse rate
*1 : By using bit 2 (JZR) of parameter No. 1401, the jog feedrate can be used for manual reference position return at all times.
*2 : When bit 0 (RPD) of parameter No. 1401 is set to 1, the setting of parameter No. 1424 is used.
*3 : When rapid traverse is used for reference position return without dogs or manual reference position return after reference position establishment, regardless of the deceleration dog, the feedrate for manual reference position return based on these functions is used (the setting of bit 1 (DLF) of parameter No. 1404 is followed).

1430	Maximum cutting feedrate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)
Specify the maximum cutting feedrate for each axis.

1432	Maximum cutting feedrate for all axes in the acceleration/deceleration before interpolation

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)
Set a maximum cutting feedrate for each axis in the acceleration/deceleration before interpolation mode such as AI contour control. When the acceleration/deceleration before interpolation mode is not set, the maximum cutting feedrate set in parameter No. 1430 is used.

1434	Maximum manual handle feedrate for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)
Set a maximum manual handle feedrate for each axis.

1440	External deceleration rate setting 2 in cutting feed

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)
Set external deceleration rate 2 for cutting feed or positioning of linear interpolation type (G00).

1441	External deceleration rate setting 2 for each axis in rapid traverse

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

Set external deceleration rate 2 for each axis in rapid traverse.

1442	Maximum manual handle feedrate setting 2 for each axis

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

Set a maximum manual handle feedrate 2 for each axis.

1443	External deceleration rate setting 3 in cutting feed

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

Set external deceleration rate 3 for cutting feed or positioning of linear interpolation type (G00).

1444	External deceleration rate setting 3 for each axis in rapid traverse

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

Set external deceleration rate 3 for each axis in rapid traverse.

1445	Maximum manual handle feedrate setting 3 for each axis

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

Set a maximum manual handle feedrate 3 for each axis.

1466	Feedrate for retraction in threading cycle G92 or G76

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

When threading cycle G92 or G76 is specified, retraction is performed after threading. Set a feedrate for this retraction.

NOTE
When this parameter is set to 0 or bit 1 (CFR) of parameter No. 1611 is set to 1, the rapid traverse rate set in parameter No. 1420 is used.

4.13 PARAMETERS OF ACCELERATION/DECELERATION CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
1601			NCI	RTO				

[Input type] Parameter input
[Data type] Bit path

 # 4 RTO Block overlap in rapid traverse
0: Blocks are not overlapped in rapid traverse.
1: Blocks are overlapped in rapid traverse.

 # 5 NCI An in-position check:
0: Confirms that the specified feedrate becomes 0 (the acceleration/deceleration delay becomes 0) at deceleration time and that the machine position has reached a specified position (the servo positional deviation is within the in-position width set by parameter No. 1827).
1: Confirms only that the specified feedrate becomes 0 (the acceleration/deceleration delay becomes 0) at deceleration time.

	#7	#6	#5	#4	#3	#2	#1	#0
1602		LS2			BS2			

[Input type] Parameter input
[Data type] Bit path

 # 3 BS2 In the acceleration/deceleration before interpolation mode:
0: Exponential acceleration/deceleration or linear acceleration/deceleration is used.
(The setting of bit 6 (LS2) of parameter No. 1602 is followed.)
1: Bell-shaped acceleration/deceleration is used.

 # 6 LS2 In the acceleration/deceleration before interpolation mode:
0: Exponential acceleration/deceleration is used.
1: Linear acceleration/deceleration is used.

	#7	#6	#5	#4	#3	#2	#1	#0
1603				PRT				

[Input type] Parameter input
[Data type] Bit path

 # 4 PRT For positioning of linear interpolation type:
0: Acceleration/deceleration of acceleration fixed type is used.
1: Acceleration/deceleration of time fixed type is used.

	#7	#6	#5	#4	#3	#2	#1	#0
1604								SHP

[Input type] Parameter input
[Data type] Bit path

 # 0 SHP When automatic operation is started, the state equivalent to the specification of G5.1Q1 for AI contour control is:
0: Not set
1: Set
Upon reset, the state where G5.1Q1 is specified is set.

	#7	#6	#5	#4	#3	#2	#1	#0
1606								MNJx

[Input type] Parameter input
[Data type] Bit axis

 # 0 MNJx In manual handle interrupt or automatic manual simultaneous operation (interrupt type):
0: Only cutting feed acceleration/deceleration is enabled, and jog feed acceleration/deceleration is disabled.
1: Both cutting feed acceleration/deceleration and jog feed acceleration/deceleration are applied.

	#7	#6	#5	#4	#3	#2	#1	#0
1610				JGLx			CTBx	CTLx

[Input type] Parameter input
[Data type] Bit axis

 # 0 CTLx Acceleration/deceleration in cutting feed or dry run
0: Exponential acceleration/deceleration is applied.
1: Linear acceleration/deceleration after interpolation is applied.

 # 1 CTBx Acceleration/deceleration in cutting feed or dry run
0: Exponential acceleration/deceleration or linear acceleration/deceleration is applied.
(depending on the setting in CTLx, bit 0 of parameter No.1610)
1: Bell-shaped acceleration/deceleration is applied.

 # 4 JGLx Acceleration/deceleration in jog feed
0: Exponential acceleration/deceleration is applied.
1: (depending on which is used for cutting feed. (depending on the setting in CTBx or CTLx, bit 1 or 0 of parameter No.1610)

	#7	#6	#5	#4	#3	#2	#1	#0
1611								CFR

[Input type] Parameter input
[Data type] Bit path

 # 0 CFR For retraction after threading in the threading cycles G92 and G76:
0: The type of acceleration/deceleration after interpolation for threading is used together with the threading time constant (parameter No. 1626) and FL feedrate (parameter No. 1627).
1: The type of acceleration/deceleration after interpolation for rapid traverse is used together with the rapid traverse time constant and FL feedrate.

> **NOTE**
> When this parameter is set to 1, an in-position check is made before retraction. For retraction, the rapid traverse rate (parameter No. 1420) is used, regardless of the setting of parameter No. 1466. When this parameter is set to 0, parameter No. 1466 is used as the feedrate for retraction. As acceleration/deceleration used for retraction, only acceleration/deceleration after interpolation is used. Rapid traverse before look-ahead interpolation and optimum torque acceleration/deceleration are disabled.

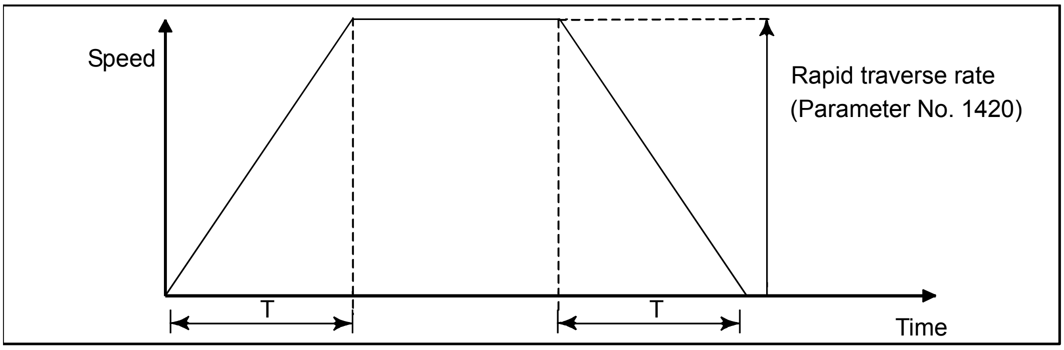
1620	Time constant T or T1 used for linear acceleration/deceleration or bell-shaped acceleration/deceleration in rapid traverse for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

Specify a time constant used for acceleration/deceleration in rapid traverse.

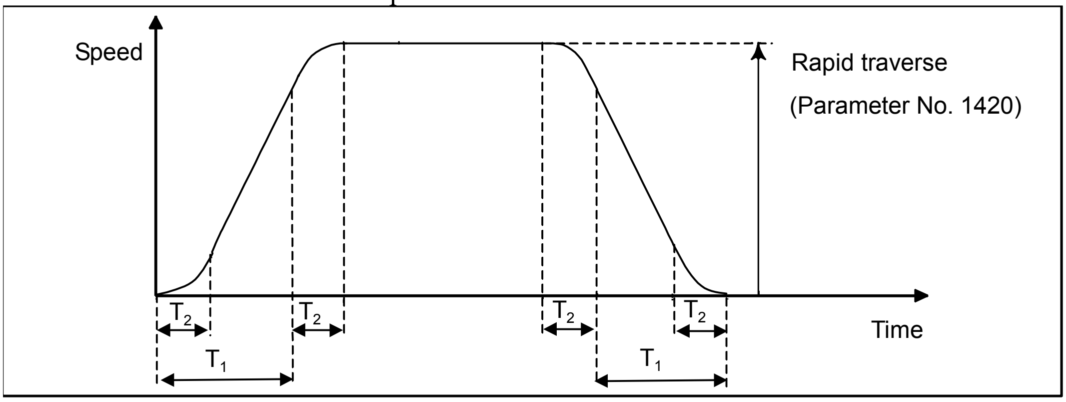
[Example]

For linear acceleration/deceleration



T : Setting of parameter No. 1620

For bell-shaped acceleration/deceleration



T_1 : Setting of parameter No. 1620

T_2 : Setting of parameter No. 1621 (However, $T_1 \geq T_2$ must be satisfied.)

Total acceleration (deceleration) time : $T_1 + T_2$

Time for linear portion : $T_1 - T_2$

Time for curve portion : $T_2 \times 2$

1621	Time constant T2 used for bell-shaped acceleration/deceleration in rapid traverse for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 1000

Specify time constant T2 used for bell-shaped acceleration/ deceleration in rapid traverse for each axis.

1622	Time constant of acceleration/deceleration in cutting feed for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 4000

Set the time constant used for exponential acceleration/deceleration in cutting feed, bell-shaped acceleration/deceleration after interpolation or linear acceleration/deceleration after interpolation in cutting feed for each axis. Except for special applications, the same time constant must be set for all axes in this parameter. If the time constants set for the axes differ from each other, proper straight lines and arcs cannot be obtained.

1623	FL rate of exponential acceleration/deceleration in cutting feed for each axis

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

Set the lower limit (FL rate) of exponential acceleration/deceleration in cutting feed for each axis.

1624	Time constant of acceleration/deceleration in jog feed for each axis.

[Input type]	Parameter input
[Data type]	Word axis
[Unit of data]	msec
[Valid data range]	0 to 4000

Set the time constant used for acceleration/deceleration in jog feed for each axis.

1625	FL rate of exponential acceleration/deceleration in jog feed for each axis

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

Set the FL rate of exponential acceleration/deceleration in cutting feed for each axis.

This parameter allows only the exponential type.

1626	Acceleration/deceleration time constant in threading cycles for each axis

[Input type]	Parameter input
[Data type]	Word axis
[Unit of data]	msec
[Valid data range]	0 to 4000

Set a time constant for acceleration/deceleration after interpolation in the threading cycles G92 and G76 for each axis.

1627	FL rate for acceleration/deceleration in threading cycles for each axis

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

Set an FL feedrate for acceleration/deceleration after interpolation in the threading cycles G92 and G76 for each axis. Set 0 at all times except in a special case.

1660	Maximum allowable acceleration rate in acceleration/deceleration before interpolation for each axis

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (D) (When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)

Set a maximum allowable acceleration rate in acceleration/deceleration before interpolation for each axis.

If a value greater than 100000.0 is set, the value is clamped to 100000.0.

If 0 is set, the specification of 100000.0 is assumed. If 0 is set for all axes, however, acceleration/deceleration before interpolation is not performed.

If a maximum allowable acceleration rate set for one axis is greater than a maximum allowable acceleration rate set for another axis by a factor or 2 or more, the feedrate at a corner where the direction of travel abruptly changes can decrease temporarily.

1671	Maximum allowable acceleration rate in acceleration/deceleration before interpolation for linear rapid traverse for each axis, or maximum allowable reference acceleration rate in optimum torque acceleration/deceleration

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)

(1) Set a maximum allowable acceleration rate in acceleration/ deceleration before interpolation for linear rapid traverse.
If a value greater than 100000.0, the value is clamped to 100000.0.
If 0 is set, the specification of the following is assumed:
1000.0 mm/sec/sec
100.0 inch/sec/sec
100.0 degrees/sec/sec
If 0 is specified for all axes, however, acceleration/deceleration before interpolation is not performed.

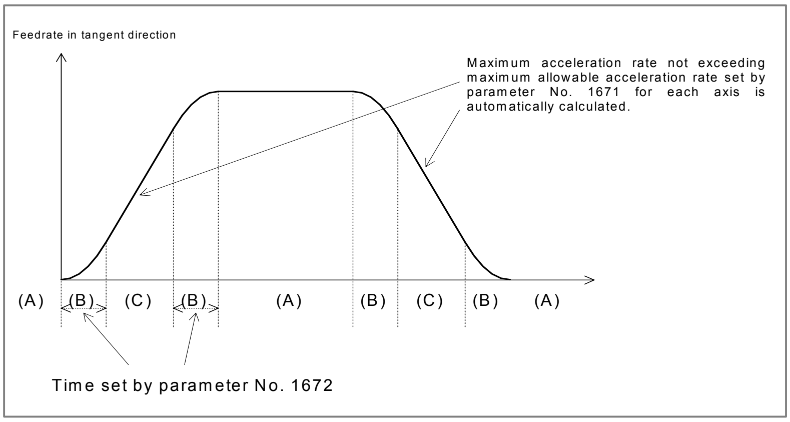
(2) Maximum allowable reference acceleration rate in optimum torque acceleration/deceleration

1672	**Acceleration change time of bell-shaped acceleration/deceleration before interpolation for linear rapid traverse, or acceleration change time of bell-shaped acceleration/deceleration in optimum torque acceleration/deceleration**

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 200

(1) Set an acceleration change time of bell-shaped acceleration/deceleration for linear rapid traverse (time for changing from the state of constant feedrate (A) to the state of constant acceleration/deceleration (C) at the acceleration rate calculated from the acceleration rate set in parameter No. 1671: time of (B) in the figure below).

(2) Set an acceleration change time of bell-shaped acceleration/deceleration in optimum torque acceleration/deceleration (time for changing from the state of constant feedrate (A) to the state of acceleration/deceleration (C) at the acceleration rate calculated from optimum torque acceleration/deceleration: time of (B) in the figure below).



1710	**Minimum deceleration ratio (MDR) for inner circular cutting feedrate change by automatic corner override**

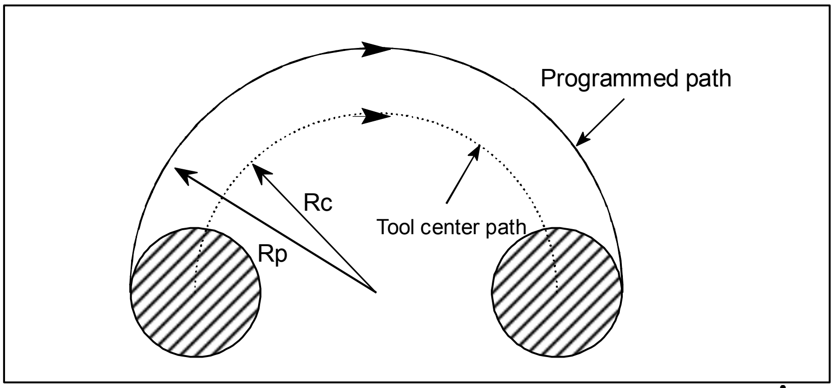
[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 100

Set a minimum deceleration ratio (MDR) for an inner circular cutting feedrate change by automatic corner override.

In the case of circular cutting offset inward, the actual feedrate is determined by a specified feedrate (F) as follows:

$$F \times \frac{Rc}{Rp}$$ (Rc:Radius of tool center path
Rp:Programmed radius)

Thus, the feedrate along the programmed path satisfies the specified value of F.



However, if Rc is too small when compared with Rp, Rc/Rp ≒ 0 results to stop the tool. So, a minimum deceleration ratio (MDR) is set, and the feedrate of the tool is set to F×(MDR) when Rc/Rp ≤ MDR.

1711	Inner determination angle (θp) for inner corner override

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 2 to 178

Set an inner determination angle for inner corner override in automatic corner overriding.

1712	Override value for inner corner override

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 1 to 100

Set an inner corner override value in automatic corner overriding.

1713	Start distance (Le) for inner corner override

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

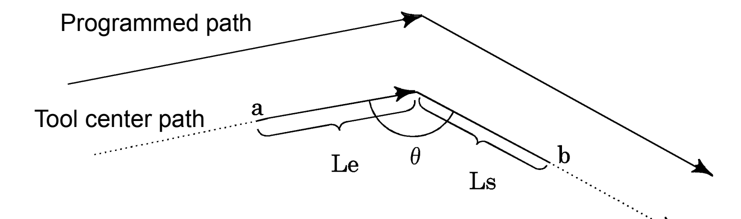
Set a start distance for inner corner override in automatic corner overriding.

1714	End distance (Ls) for inner corner override

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set an end distance for inner corner override in automatic corner overriding.

When $\theta \leq \theta p$, an inner corner is assumed. (Parameter No. 1711 is used to set θp.)
When a corner is determined to be an inner corner, an override is applied to the feedrate in the range of Le in the previous block from the intersection of the corner and in the range of Ls in the next block from the intersection of the corner.
Distances Le and Ls represent linear distances from the intersection of a corner to points on the tool center path.
Le and Ls are set in parameter No. 1713 and No. 1714.



An override is applied to the range from point a to point b.

1722	Rapid traverse feedrate reduction ratio for overlapping rapid traverse blocks

[Input type] Parameter input
[Data type] Byte axis
[Unit of data] %
[Valid data range] 0 to 100

This parameter is used when rapid traverse blocks are arranged successively, or when a rapid traverse block is followed by a block that does not cause, movement. When the feedrate for each axis of a block is reduced to the ratio set in this parameter, the execution of the next block is started.

> **NOTE**
> The parameter No.1722 is effective when parameter No.1601 #4 (RTO) is set to 1.

1732	Minimum allowable feedrate for the deceleration function based on acceleration in circular interpolation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

With the deceleration function based on acceleration in circular interpolation, an optimum feedrate is automatically calculated so that acceleration produced by changing the move direction in circular interpolation does not exceed the maximum allowable acceleration rate specified in parameter No. 1735.
If the radius of an arc is very small, a calculated feedrate may become too low.
In such a case, the feedrate is prevented from decreasing below the value specified in this parameter.

> **NOTE**
> During involute interpolation, the minimum allowable feedrate of "clamping of acceleration near a basic circle" in involute interpolation automatic feedrate control is used.

1735	Maximum allowable acceleration rate for the deceleration function based on acceleration in circular interpolation for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)

Set a maximum allowable acceleration rate for the deceleration function based on acceleration in circular interpolation.
Feedrate is controlled so that acceleration produced by changing the move direction in circular interpolation does not exceed the value specified in this parameter.
For an axis with 0 set in this parameter, the deceleration function based on acceleration is disabled.
If a different value is set in this parameter for each axis, a feedrate is determined from the smaller of the acceleration rates specified for the two circular axes.

NOTE
During involute interpolation, the minimum allowable feedrate of "clamping of acceleration near a basic circle" in involute interpolation automatic feedrate control is used.

1737	Maximum allowable acceleration rate for the deceleration function based on acceleration in AI contour control for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)

Set a maximum allowable acceleration rate produced by changing the tool move direction.
For an axis with 0 set in this parameter, the deceleration function based on acceleration is disabled. If 0 is set for all axes, the deceleration function based on acceleration is not performed.
In circular interpolation, however, the deceleration function based on feedrate control using acceleration in circular interpolation (parameter No. 1735) is enabled.

1738	**Minimum allowable feedrate for the deceleration function based on acceleration in AI contour control**

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

With the deceleration function based on acceleration in AI contour control, a feedrate most suitable for a desired figure is automatically calculated.
Depending on the figure, however, the calculated feedrate may become too low.
In such a case, the feedrate is prevented from decreasing below the value specified in this parameter.
If overriding using the deceleration function based on cutting load is enabled, a feedrate lower than the minimum allowable feedrate may be used.

1763	**FL rate for acceleration/deceleration after cutting feed interpolation for each axis in the acceleration/deceleration before interpolation mode**

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

Set a minimum allowable feedrate (FL feedrate) for acceleration/ deceleration after cutting feed interpolation in acceleration/ deceleration before interpolation as in AI contour control.

1769	**Time constant for acceleration/deceleration after cutting feed interpolation in the acceleration/deceleration before interpolation mode**

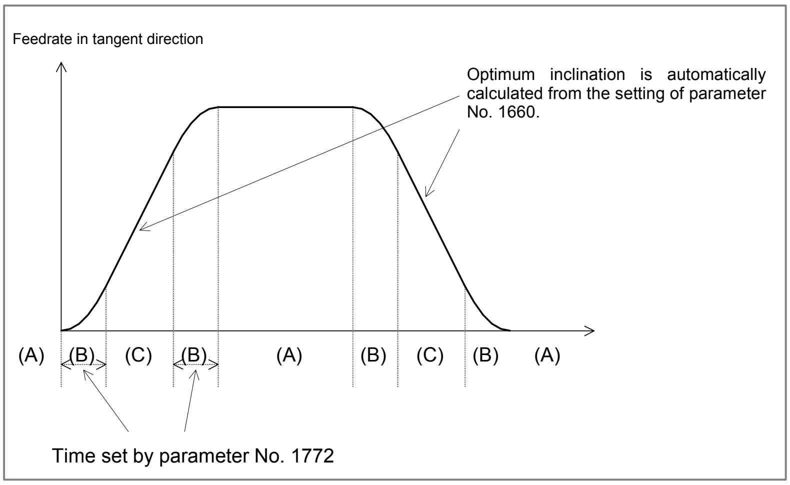
[Input type]	Parameter input
[Data type]	Word axis
[Unit of data]	msec
[Valid data range]	0 to 4000

In the acceleration/deceleration before interpolation mode as in AI contour control, not the ordinary time constant (parameter No. 1622) but the value of this parameter is used.
Be sure to specify the same time constant value for all axes except for a special application. If different values are set, correct linear and circular figures cannot be obtained.

1772	Acceleration change time of bell-shaped acceleration/deceleration before interpolation

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 200

Set an acceleration change time of bell-shaped acceleration/ deceleration before interpolation (time for changing from the state of constant feedrate (A) to the state of constant acceleration/deceleration (C) at the acceleration rate calculated from the acceleration rate set in parameter No. 1660: time of (B) in the figure below).



1783	Maximum allowable feedrate difference for feedrate determination based on corner feedrate difference

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

If a feedrate component change for each axis exceeding the value set in this parameter occurs at the joint of blocks, the feedrate determination function based on corner feedrate difference finds a feedrate not exceeding the set value and performs deceleration by using acceleration/deceleration before interpolation. Thus, a shock to the machine and machining error at a corner can be reduced.

1788	Maximum allowable acceleration change rate in feedrate determination based on acceleration change for each axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)

Set a maximum allowable acceleration change rate for each axis in feedrate control based on acceleration change under control on the rate of change of acceleration.

For an axis with 0 set in this parameter, feedrate control based on acceleration change is disabled.

If 0 is set for all axes, feedrate control based on acceleration change is not exercised.

1789	Maximum allowable acceleration change rate in feedrate determination based on acceleration change for each axis (linear interpolation)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0.)

Set a maximum allowable acceleration change rate for each axis in feedrate control based on acceleration change under control on the rate of change of acceleration in successive linear interpolation operations.

In feedrate control based on acceleration change at a corner between linear interpolation operations, the maximum allowable acceleration change rate not set in parameter No. 1788 but set in this parameter is valid.

For an axis with 0 set in this parameter, the maximum allowable acceleration change rate set in parameter No. 1788 is valid.

Feedrate control based on acceleration change is disabled for an axis with 0 set in parameter No. 1788, so that the setting of this parameter for such an axis is ignored.

1790	Ratio of change time of the rate of change of acceleration in smooth bell-shaped acceleration/deceleration before interpolation

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 50

Set the ratio of the change time of the rate of change of acceleration to the change time of acceleration(*1) by percentage (%) in smooth bell-shaped acceleration/deceleration before look-ahead interpolation.
If 0 is set in this parameter or a value not within the valid data range is specified in this parameter, smooth bell-shaped acceleration/ deceleration before look-ahead interpolation is not performed.

(*1)
Parameter No. 1772 for acceleration/deceleration before look-ahead interpolation (cutting feed).
Parameter No. 1672 for acceleration/deceleration before interpolation in linear rapid traverse, or for optimum torque acceleration/ deceleration.

1791	Acceleration rate on each axis for the outage-time deceleration stop function

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(0.0 to +100000.0 for the metric system, 0.0 to +10000.0 for the inch system)

Set an acceleration rate for deceleration on an axis on which the tool is decelerated to a stop at the time of power outage.
On an axis for which this parameter is set to 0, deceleration based on the outage-time deceleration signal is not performed.

In synchronization control or tandem control, set the same parameter for the master axis and slave axis.

4.14 PARAMETERS OF SERVO

		#7	#6	#5	#4	#3	#2	#1	#0
1800					RBK	FFR		CVR	

[Input type] Parameter input
[Data type] Bit path

 # 1 CVR When velocity control ready signal VRDY is set ON before position control ready signal PRDY comes ON
0: A servo alarm is generated.
1: A servo alarm is not generated.

 # 3 FFR Feed-forward control in rapid traverse is:
0: Disabled
1: Enabled
Feed-forward is enabled only in normal cutting feed. When this parameter is set to 1, feed-forward is enabled in rapid traverse as well. This capability reduces the servo positional deviation, thus reducing the time required to enter the in-position width at the time of positioning.

 # 4 RBK Backlash compensation applied separately for cutting feed and rapid traverse
0: Not performed
1: Performed

		#7	#6	#5	#4	#3	#2	#1	#0
1801				CIN	CCI				

[Input type] Parameter input
[Data type] Bit path

 # 4 CCI As the in-position width for cutting feed:
0: The parameter (No. 1826) applicable to rapid traverse as well is used.
1: The parameter (No. 1827) dedicated to cutting feed is used.
This parameter enables the in-position width for cutting feed (parameter No. 1827) to be set instead of the in-position width for rapid traverse (parameter No. 1826).
By setting bit 4 (CCI) of parameter No. 1801, choose whether to use this function or the conventional in-position check function.
This function, when specified, is enabled for all axes. So, for an axis that does not require this function, set the same data in parameter No. 1826 and No. 1827.

 # 5 CIN When CCI is set to 1, the dedicated parameter for specifying an in-position width for cutting feed is used:

0: Only when the next block specifies cutting feed.

1: Regardless of the next block.

The table below indicates the relationships between the parameters for cutting feed and rapid traverse.

		Parameter CIN(No.1801 #5)			
		0		1	
Parameter CCI (No.1801 #4)	0	Rapid traverse → Rapid traverse	No.1826	Rapid traverse → Rapid traverse	No.1826
		Rapid traverse → Cutting feed	No.1826	Rapid traverse → Cutting feed	No.1826
		Cutting feed → Cutting feed	No.1826	Cutting feed → Cutting feed	No.1826
		Cutting feed → Rapid traverse	No.1826	Cutting feed → Rapid traverse	No.1826
	1	Rapid traverse → Rapid traverse	No.1826	Rapid traverse → Rapid traverse	No.1826
		Rapid traverse → Cutting feed	No.1826	Rapid traverse → Cutting feed	No.1826
		Cutting feed → Cutting feed	No.1827	Cutting feed → Cutting feed	No.1827
		Cutting feed → Rapid traverse	No.1826	Cutting feed → Rapid traverse	No.1827

The parameters CCI and CIN can also be applied to a Cs axis.

	#7	#6	#5	#4	#3	#2	#1	#0
1802						DC2x	DC4x	

[Input type] Parameter input
[Data type] Bit axis

 # 1 DC4x When the reference position is established on the linear scale with reference marks:

0: An absolute position is established by detecting three reference marks.

1: An absolute position is established by detecting four reference marks.

 # 2 DC2x Reference position establishment operation for a linear scale with reference marks is performed as follows:

0: The setting of bit 1 (DC4) of parameter No. 1802 is followed.

1: An absolute position is established by detecting two reference marks.

NOTE
1 When this parameter is set to 1, specify the direction of the scale zero point by setting bit 4 (SCP) of parameter No. 1817.
2 When a rotary encoder with absolute address reference marks is used, this parameter is invalid. Even when this parameter is set to 1, the setting of bit 1 (DC4) of parameter No. 1802 is followed.

	#7	#6	#5	#4	#3	#2	#1	#0
1803	NFP			TQF			TQA	TQI

[Input type] Parameter input
[Data type] Bit path

 # 0 TQI Within a torque limit, an in-position check is:
0: Made.
1: Not made.

 # 1 TQA Within a torque limit, an excessive stop-time/move-time error is:
0: Checked.
1: Not checked.

 # 4 TQF When torque control is performed by the PMC axis control, follow-up operation is:
0: Not performed.
1: Performed.

 # 7 NFP If position matching between the machine position and absolute position detector is not performed even once, follow-up operation is:
0: Not performed.
1: Performed.

	#7	#6	#5	#4	#3	#2	#1	#0
1804		SAK	ANA	IVO				

[Input type] Parameter input
[Data type] Bit path

 # 4 IVO When an attempt is made to release an emergency stop while the VRDY OFF alarm ignore signal is 1:
0: The emergency stop state is not released until the VRDY OFF alarm ignore signal is set to 0.
1: The emergency stop state is released.

NOTE
When a reset is issued while the VRDY OFF alarm ignore signal is set to 1 and the motor activating current is low, the reset state can also be released, provided this parameter is set to 1.

 # 5 ANA When an abnormal load is detected for an axis:
0: Movement along all axes is stopped, and a servo alarm is output.
1: No servo alarm is output, and movement along only the axes of the group containing the axis with the abnormal load is stopped in interlock mode. (The group number of each axis is set in parameter No.1881.)

 # 6 SAK When the VRDY OFF alarm ignore signal IGNVRY is 1, or when the VRDY OFF alarm ignore signals IGNVRYn are 1:
0: Servo ready signal SA is set to 0.
1: Servo ready signal SA remains set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
1805				TSM	TSA		TRE	

[Input type] Parameter input
[Data type] Bit path

 # 1 TRE When bit 4 of parameter No. 1803 is set to 0 (not to perform follow-up operation with a torque control command in PMC axis control), the servo error counter is:
0: Updated.
When the error count exceeds the maximum allowable cumulative travel value (parameter No. 1885), the alarm (SV0423) is issued.
1: Not updated.
No errors are accumulated, so that the alarm (SV0423) is not issued. When the maximum allowable feedrate is exceeded, however, the alarm (SV0422) is issued.

To return to position control when this parameter bit is set to 1, a reference position return operation needs to be performed.

 # 3 TSA As the abnormal load detection level during dwell, M code execution, and automatic operation halt state:
0: The threshold value for rapid traverse is used. (parameter No.2142)
1: The threshold value for cutting feed is used. (parameter No.2104)

This parameter is valid when bit 3 (ABG0) of parameter No. 2200 is set to 1.

 # 4 TSM As the abnormal load detection level in the jog feed mode (excluding manual rapid traverse) and manual handle feed mode:
0: The threshold value for rapid traverse is used. (parameter No.2142)
1: The threshold value for cutting feed is used. (parameter No.2104)

This parameter is valid when bit 3 (ABG0) of parameter No. 2200 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
1814	ALGx							

[Input type] Parameter input
[Data type] Bit axis

 # 7 ALGx The servo axis loop gain in the Cs contour control mode is:
0: Not matched with the Cs contour control loop gain.
1: Matched with the Cs contour control loop gain.

	#7	#6	#5	#4	#3	#2	#1	#0
1815		RONx	APCx	APZx	DCRx	DCLx	OPTx	

[Input type] Parameter input
[Data type] Bit axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 1 OPTx Position detector
0: A separate pulse coder is not used.
1: A separate pulse coder is used.

NOTE
Set this parameter to 1 when using a linear scale with reference marks or a linear scale with an absolute address zero point (full-closed system).

 # 2 DCLx As a separate position detector, a linear scale with reference marks or a linear scale with an absolute address zero point is:
0: Not used.
1: Used.

 # 3 DCRx As a scale with absolute address reference marks:
0: A rotary encoder with absolute address reference marks is not used.
1: A rotary encoder with absolute address reference marks is used.

NOTE
When using a rotary encoder with absolute address reference marks, set also bit 2 (DCLx) of parameter No. 1815 to 1.

 # 4 APZx Machine position and position on absolute position detector when the absolute position detector is used
0: Not corresponding
1: Corresponding
When an absolute position detector is used, after primary adjustment is performed or after the absolute position detector is replaced, this parameter must be set to 0, power must be turned off and on, then manual reference position return must be performed. This completes the positional correspondence between the machine position and the

position on the absolute position detector, and sets this parameter to 1 automatically.

 # 5 APCx Position detector
0: Other than absolute position detector
1: Absolute position detector (absolute pulse coder)

 # 6 RONx With a rotation axis, a rotary encoder for detecting an absolute position within one revolution is:
0: Not used.
1: Used.

	#7	#6	#5	#4	#3	#2	#1	#0
1816		DM3x	DM2x	DM1x				

[Input type] Parameter input
[Data type] Bit axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

#4 DM1
#5 DM2
#6 DM3

By using DM1, DM2, and DM3, a detection multiplication factor (DMR) is set.
This parameter is valid when a separate position detector (AB phase) is used and parameter No. 2084 and No. 2085 are not set.

DM3	DM2	DM1	DMR
0	0	0	1/2
0	0	1	1
0	1	0	3/2
0	1	1	2
1	0	0	5/2
1	0	1	3
1	1	0	7/2
1	1	1	4

	#7	#6	#5	#4	#3	#2	#1	#0
1817		TANx		SCPx		SBLx		

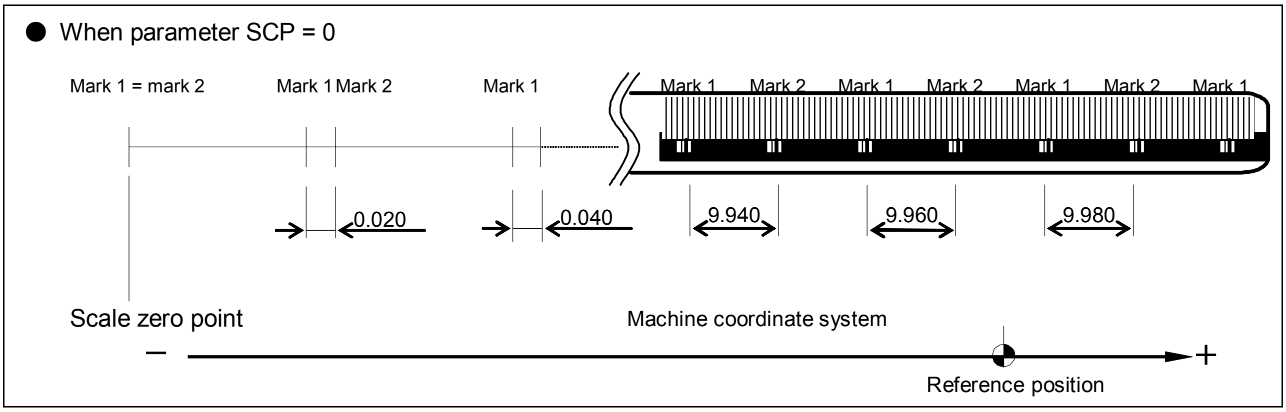
[Input type] Parameter input
[Data type] Bit axis

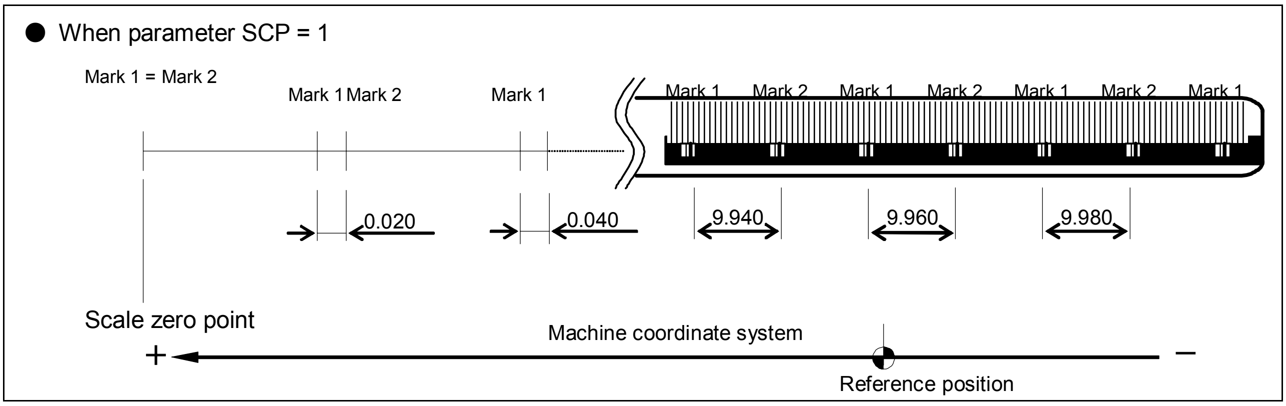
NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 2 SBLx Smooth backlash compensation is :
0: Disabled.
1: Enabled.

 # 4 SCPx For two-point measurement (when bit 2 (DC2) of parameter No. 1802 is set to 1), the scale zero point direction is:
0: On the minus side. (The reference position is located in the plus direction when viewed from the scale zero point.)
1: On the plus side. (The reference position is located in the minus direction when viewed from the scale zero point.)

> **NOTE**
> 1 This parameter is valid when bit 2 (DC2) of parameter No. 1802 is set to 1.
> 2 If this parameter is set to an incorrect value, an incorrect coordinate system is established. In such a case, reverse the setting then perform reference position establishment operation again.





 # 6 TANx Tandem control
0: Not used
1: Used

> **NOTE**
> Set this parameter to both master axis and slave axis.

	#7	#6	#5	#4	#3	#2	#1	#0

1818					SDC	DG0	RF2x	RFSx

[Input type] Parameter input
[Data type] Bit axis

 # 0 RFSx If G28 is specified for an axis for which a reference position is not established (ZRF = 0) when a linear scale with an absolute address zero point or a linear scale with absolute address reference marks is used:
0: A movement is made to the reference position after reference position establishment operation.
1: No movement is made after reference position establishment operation, but the operation is completed.

> **NOTE**
> This parameter disables movement based on the G28 command to a reference position. So, use this parameter only in special cases.

 # 1 RF2x If G28 is specified for an axis for which a reference position is already established (ZRF = 1) when a linear scale with an absolute address zero point or a linear scale with absolute address reference marks is used:
0: A movement is made to the reference position.
1: No movement is made to the intermediate position and reference position, but the operation is completed.

> **NOTE**
> This parameter disables movement based on the G28 command to a reference position. So, use this parameter only in special cases.

 # 2 DG0 When the linear scale function with absolute address reference marks is used, reference position establishment operation based on the G00 command and jog feed is:
0: Disabled.
1: Enabled.

 # 3 SDCx A linear scale with an absolute address zero point is:
0: Not used.
1: Used.

	#7	#6	#5	#4	#3	#2	#1	#0
1819	NAHx					DATx	CRFx	FUPx

[Input type] Parameter input
[Data type] Bit axis

 # 0 FUPx To perform follow-up when the servo is off is set for each axis.
0: The follow-up signal, *FLWU, determines whether follow-up is performed or not.

When *FLWU is 0, follow-up is performed.
When *FLWU is 1, follow-up is not performed.
1: Follow-up is not performed.

> **NOTE**
> When using the index table indexing function, set FUPx to 1 for a control axis subject to index table indexing.

 # 1 CRFx When the servo alarm SV0445 (soft disconnection), SV0447 (hard disconnection (separate)), or SV0421 (dual position feedback excessive error) is issued:
0: The reference position established state is not affected.
1: The reference position unestablished state is assumed. (Bit 4 (APZ) of parameter No. 1815 is set to 0.)

 # 2 DATx When a linear scale with an absolute address zero point or a linear scale with absolute address reference marks is used, the automatic setting of parameter No. 1883 and No. 1884 at manual reference position return time is:
0: Not performed.
1: Performed.

The automatic setting procedure is as follows:
<1> Set an appropriate value in parameter No. 1815, No. 1821, and No. 1882.
<2> Position the machine at the reference position by manual operation.
<3> Set this parameter to 1.
<4> Perform a manual reference position return operation. Upon completion of manual reference position return operation, parameter No. 1883 and No. 1884 are set, and this parameter is automatically set to 0.

 # 7 NAHx In the advanced preview control mode, advanced preview feed-forward is:
0: Used
1: Not used

1820	Command multiplier for each axis (CMR)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] See below :
Set a command multiplier indicating the ratio of the least command increment to the detection unit for each axis.
Least command increment = detection unit × command multiplier

Relationship between the increment system and the least command increment

(1) T series

			Least input increment	Least command increment
IS-B	Millimeter machine	Millimeter input	0.001 mm (diameter specification)	0.0005 mm
			0.001 mm (radius specification)	0.001 mm
		Inch input	0.0001 inch (diameter specification)	0.0005 mm
			0.0001 inch (radius specification)	0.001 mm
	Inch machine	Millimeter input	0.001 mm (diameter specification)	0.00005 inch
			0.001 mm (radius specification)	0.0001 inch
		Inch input	0.0001 inch (diameter specification)	0.00005 inch
			0.0001 inch (radius specification)	0.0001 inch
	Rotation axis		0.001 deg	0.001 deg

			Least input increment	Least command increment
IS-C	Millimeter machine	Millimeter input	0.0001 mm (diameter specification)	0.00005 mm
			0.0001 mm (radius specification)	0.0001 mm
		Inch input	0.00001 inch (diameter specification)	0.00005 mm
			0.00001 inch (radius specification)	0.0001 mm
	Inch machine	Millimeter input	0.0001 mm (diameter specification)	0.000005 inch
			0.0001 mm (radius specification)	0.00001 inch
		Inch input	0.00001 inch (diameter specification)	0.000005 inch
			0.00001 inch (radius specification)	0.00001 inch
	Rotation axis		0.0001 deg	0.0001 deg

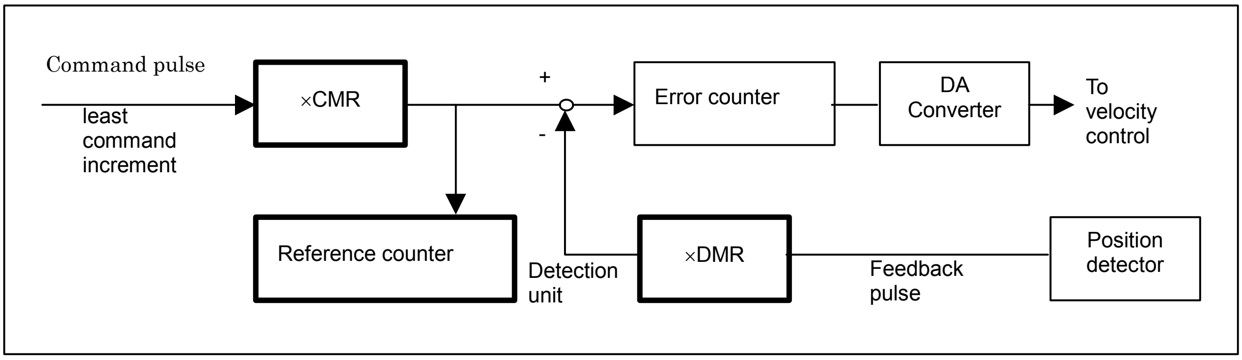
			Least input increment	Least command increment
IS-D	Millimeter machine	Millimeter input	0.00001 mm (diameter specification)	0.000005 mm
			0.00001 mm (radius specification)	0.00001 mm
		Inch input	0.000001 inch (diameter specification)	0.000005 mm
			0.000001 inch (radius specification)	0.00001 mm
	Inch machine	Millimeter input	0.00001 mm (diameter specification)	0.0000005 inch
			0.00001 mm (radius specification)	0.000001 inch
		Inch input	0.000001 inch (diameter specification)	0.0000005 inch
			0.000001 inch (radius specification)	0.000001 inch
	Rotation axis		0.00001 deg	0.00001 deg

			Least input increment	Least command increment
IS-E	Millimeter machine	Millimeter input	0.000001 mm (diameter specification)	0.0000005 mm
			0.000001 mm (radius specification)	0.000001 mm
		Inch input	0.0000001 inch (diameter specification)	0.0000005 mm
			0.0000001 inch (radius specification)	0.000001 mm
	Inch machine	Millimeter input	0.000001 mm (diameter specification)	0.00000005 inch
			0.000001 mm (radius specification)	0.0000001 inch
		Inch input	0.0000001 inch (diameter specification)	0.00000005 inch
			0.0000001 inch (radius specification)	0.0000001 inch
	Rotation axis		0.000001 deg	0.000001 deg

(2) M series

Increment system	Least input increment and least command increment					
	IS-A	IS-B	IS-C	IS-D	IS-E	Unit
Millimeter machine	0.01	0.001	0.0001	0.00001	0.000001	mm
Millimeter input	0.001	0.0001	0.00001	0.000001	0.0000001	inch
Rotation axis	0.01	0.001	0.0001	0.00001	0.000001	deg

Setting command multiply (CMR), detection multiply (DMR), and the capacity of the reference counter



Set CMR and DMR so that the pulse weight of + input (command from the CNC) into the error counter matches the pulse weight of -input (feedback from the position detector).
[Least command increment]/CMR=[Detection unit]=[Feedback pulse unit]/DMR
[Least command increment]: Minimum unit of commands issued from the CNC to the machine
[Detection unit]: Minimum unit for machine position detection

The unit of feedback pulses varies, depending on the type of detector.
[Feedback pulse unit]=[Amount of travel per rotation of the pulse coder]/[Number of pulses per rotation of the pulse coder]

As the size of the reference counter, specify the grid interval for the reference position return in the grid method.
[Size of the reference counter]=[Grid interval]/[Detection unit]
[Grid interval]=[Amount of travel per rotation of the pulse coder]

The setting of a command multiplier is as follows:

(1) When command multiplier is 1 to 1/27
Set value = 1 / command multiplier + 100
Valid data range : 101 to 127

(2) When command multiply is 0.5 to 48
Set value = 2 × command multiplier
Valid data range : 1 to 96

NOTE
If a feedrate exceeding the feedrate found by the expression below is used, an incorrect travel amount may result or a servo alarm may be issued. Be sure to use a feedrate not exceeding the feedrate found by the following expression:
Fmax[mm/min] = $196602 \times 10^4 \times$ least command increment / CMR

1821	Reference counter size for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

Set a reference counter size.
As a reference counter size, specify a grid interval for reference position return based on the grid method.
When a value less than 0 is set, the specification of 10000 is assumed.
When a linear scale with absolute address reference marks is used, set the interval of mark 1.

1822	Value of the numerator of arbitrary command multiplier n/m

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 9999

Set the value of the numerator of the arbitrary command multiplier n/m.
The arbitrary command multiplier option is required.
When a value other than 0 is set in parameter No. 1822 and No. 1823, the setting of the arbitrary command multiplier n/m (n: No. 1822, m: No. 1823) becomes valid.

1823	Value of the denominator of arbitrary command multiplier n/m

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 9999

Set the value of the denominator of the arbitrary command multiplier n/m.
The arbitrary command multiplier option is required.
When a value other than 0 is set in parameter No. 1822 and No. 1823, the setting of the arbitrary command multiplier n/m (n: No. 1822, m: No. 1823) becomes valid.

1825	Servo loop gain for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] 0.01/sec
[Valid data range] 1 to 9999

Set the loop gain for position control for each axis.

When the machine performs linear and circular interpolation (cutting), the same value must be set for all axes. When the machine requires positioning only, the values set for the axes may differ from one another. As the loop gain increases, the response by position control is improved. A too large loop gain, however, makes the servo system unstable.

The relationship between the positioning deviation (the number of pulses counted by the error counter) and the feedrate is expressed as follows:

Positioning deviation = Feedrate / (60 × Loop gain)

Unit : Positioning deviation mm, inch or deg
Feedrate mm/min, inch/min, or deg/min
Loop gain 1/sec

1826	In-position width for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

The in-position width is set for each axis.

When the deviation of the machine position from the specified position (the absolute value of the positioning deviation) is smaller than the in-position width, the machine is assumed to have reached the specified position. (The machine is in the in-position state.)

1827	In-position width in cutting feed for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

Set an in-position width for each axis in cutting feed. This parameter is used when bit 4 (CCI) of parameter No.1801=1.

1828	Positioning deviation limit for each axis in movement

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

Set the positioning deviation limit in movement for each axis.

If the positioning deviation exceeds the positioning deviation limit during movement, a servo alarm (SV0411) is generated, and operation is stopped immediately (as in emergency stop).

Generally, set the positioning deviation for rapid traverse plus some margin in this parameter.

1829	Positioning deviation limit for each axis in the stopped state

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

Set the positioning deviation limit in the stopped state for each axis.

If, in the stopped state, the positioning deviation exceeds the positioning deviation limit set for stopped state, a servo alarm (SV0410) is generated, and operation is stopped immediately (as in emergency stop).

1830	Axis-by-axis positional deviation limit at servo-off time

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter is used to set a positional deviation limit at servo-off time, on an axis-by-axis basis.

If the value specified with this parameter is exceeded at servo-off time, a servo alarm is issued to cause an immediate stop (same as an emergency stop). Usually, set the same value as a positional deviation at stop time.

1832	Feed stop positioning deviation for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

Set the feed stop positioning deviation for each axis.
If the positioning deviation exceeds the feed stop positioning deviation during movement, pulse distribution and acceleration/ deceleration control are stopped temporarily. When the positioning deviation drops to the feed stop positioning deviation or below, pulse distribution and acceleration/deceleration control are resumed.
The feed stop function is used to reduce overshoot in acceleration/ deceleration mainly by large servo motors.
Generally, set the middle value between the positioning deviation limit during movement and the positioning deviation at rapid traverse as the feed stop positioning deviation.

1836	Servo error amount where reference position return is possible

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a servo error used to enable reference position return.
In general, set this parameter to 0. (When 0 is set, 128 is assumed as the default.)
If, during reference position return, such a feedrate as exceeding a set value is not reached even once before the limit switch for deceleration is released (the deceleration signal (*DEC) is set to 1 again), the alarm (PS0090) "REFERENCE POSITION RETURN FAILURE" is issued.
If, during reference position return, such a feedrate as exceeding a set servo error amount is not reached even once before the limit switch for deceleration is released (the deceleration signal is set to 1 again), the alarm (PS0090) "REFERENCE POSITION RETURN FAILURE" is issued.

1844	Distance to the first grid point after the deceleration dog is turned off in the case where the reference position shift amount of the reference position shift function is 0

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -999999999 to 999999999

Set a distance to the first grid point after the deceleration dog is turned off in the case where the reference position shift amount (No. 1850) is 0.

NOTE
This parameter is automatically set if reference position return is performed when bit 4 (SFDx) of parameter No. 1008 is set to 1, the distance to the first grid point after the deceleration dog is turned off (parameter No. 1844) is set to 0, and the reference position shift amount (parameter No. 1850) is set to 0.
Do not change an automatically set value.

1846	Distance for starting the second stage of smooth backlash compensation

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

For each axis, set the distance from the point where the axis movement direction is reversed to the point where the second stage of smooth backlash compensation is started.

1847	Distance for ending the second stage of smooth backlash compensation

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

For each axis, set the distance from the point where the axis movement direction is reversed to the point where the second stage of smooth backlash compensation is ended.

1848	Value of the first stage of smooth backlash compensation

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -9999 to 9999

Set the value of the first stage of smooth backlash compensation for each axis.

1850	Grid shift and reference position shift for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

To shift the reference position, the grid can be shifted by the amount set in this parameter. Up to the maximum value counted by the reference counter can be specified as the grid shift.
In case of parameter SFDx(No.1008#4) is 0: Grid shift
In case of parameter SFDx(No.1008#4) is 1: Reference point shift

> **NOTE**
> For setting the reference position without dogs, only the grid shift function can be used.
> (The reference position shift function cannot be used.)

1851	Backlash compensating value for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -9999 to 9999

Set the backlash compensating value for each axis.
When the machine moves in a direction opposite to the reference position return direction after the power is turned on, the first backlash compensation is performed.

1852	Backlash compensating value used for rapid traverse for each axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -9999 to 9999

Set the backlash compensating value used in rapid traverse for each axis. (This parameter is valid when RBK, #4 of parameter 1800, is set to 1.) More precise machining can be performed by changing the backlash compensating value depending on the feedrate, the cutting feed or the rapid traverse positioning. Let the measured backlash at cutting feed be A and the measured backlash at rapid traverse be B. The backlash compensating value is shown below depending on the change of feedrate (cutting feed or rapid traverse) and the change of the direction of movement.

Change of feedrate / Change of direction of movement	Cutting feed to cutting feed	Rapid traverse to rapid traverse	Rapid traverse to cutting feed	Cutting feed to rapid traverse
Same direction	0	0	$\pm\alpha$	$\pm(-\alpha)$
Opposite direction	$\pm$A	$\pm$B	$\pm(B+\alpha)$	$\pm(B+\alpha)$

NOTE
1. $\alpha=(A-B)/2$
2. The positive or negative direction for compensating values is the direction of movement.

1874	Numerator of the flexible feed gear for the built-in position detector

1875	Denominator of the flexible feed gear for the built-in position detector

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 1 to 32767

When using temporary absolute coordinate setting, set the flexible feed gear for the built-in position detector on each axis. The settings are as follows:

$$\frac{\text{No.1874}}{\text{No.1875}} = \frac{\text{Number of position feedback pulses per motor revolution}}{1,000,000}$$

1880	Abnormal load detection alarm timer

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767

This parameter sets the time from the detection of an abnormal load until a servo alarm is issued.
When 0 is set, however, the specification of 200 msec is assumed.

1881	Group number when an abnormal load is detected

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 32

Set the group number on each axis when an abnormal load is detected.
When an abnormal load is detected on an axis, only the movements on those axes that belong to the same group as the axis are stopped.
If 0 is set for an axis, the movement on the axis is stopped when an abnormal load is detected on any other axis.
This parameter is valid when bit 5 (ANA) of parameter No. 1804 is set to 1.

[Example]

When the settings indicated below are made, and an abnormal load is detected on the 6th axis, the movements on the 2nd axis, 4th axis, 6th axis, and 7th axis are stopped. When an abnormal load is detected on the 4th axis, the movements on the 4th axis and the 7th axis are stopped.

Parameter No. 1881	Setting value
(1st axis)	1
(2nd axis)	2
(3rd axis)	1
(4th axis)	0
(5th axis)	3
(6th axis)	2
(7th axis)	0

1882	Interval of mark 2 of a linear scale with absolute address reference marks

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

Set the interval of mark 2 of a linear scale with absolute address reference marks.

1883	Distance 1 from the scale zero point to reference position

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -999999999 to 999999999

1884	Distance 2 from the scale zero point to reference position

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] -999 to 999

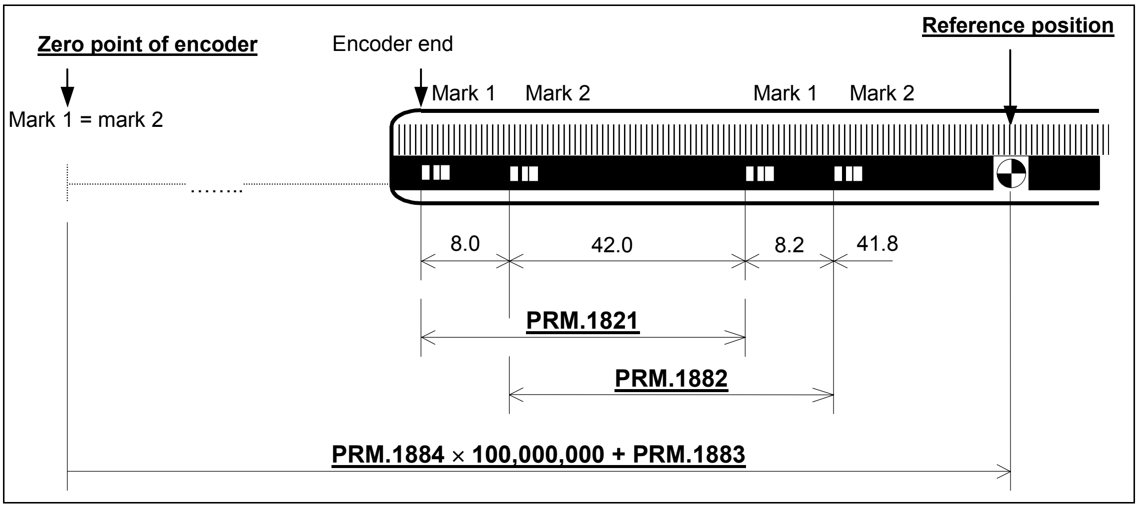
Use this parameter when the distance from the scale zero point to the reference position exceeds the setting range specified in parameter No. 1883.

Parameter No. 1883 and No. 1884 are used to set the distance from the scale zero point to the reference position on a linear scale with absolute address reference marks or a linear scale with an absolute address zero point.

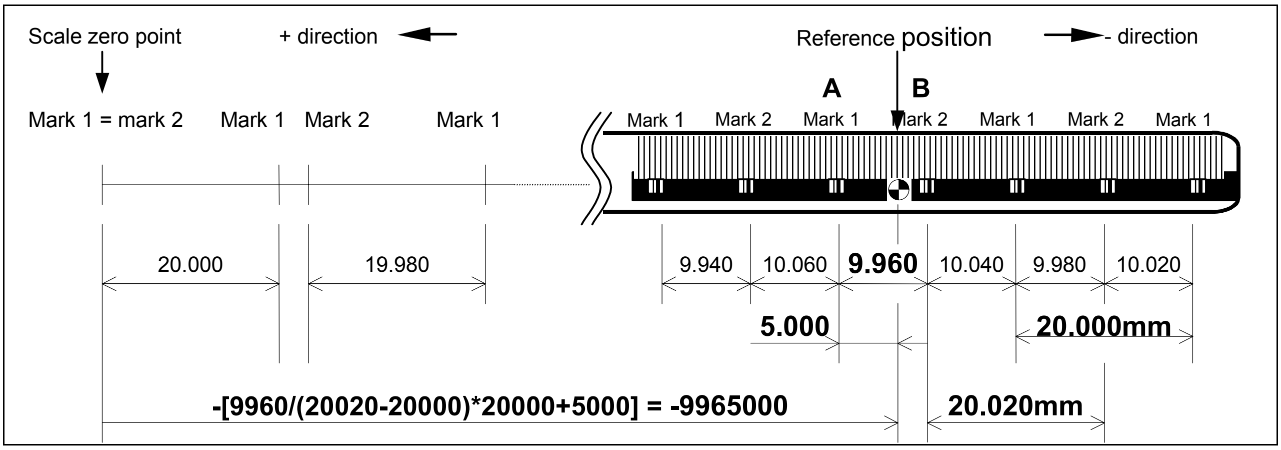
Distance from the zero point to the reference position of a linear scale
= No. 1884 × 1,000,000,000 + No. 1883

The scale zero point represents a point where mark 1 and mark 2 match. Usually, this point is a virtual point that does not physically exist on the scale. (See the figure below.)

If the reference position is placed in the + direction when viewed from the scale zero point, set a positive value. If the reference position is placed in the - direction when viewed from the scale zero point, set a negative value.



[Example of parameter settings] When an encoder as shown below is used with an IS-B, millimeter machine:



Parameters

No.1821 (interval of mark 1) = 20000
No.1882 (interval of mark 2) = 20020
No.1883 (reference position) = position of point A + 5.000
= distance between A and B/(mark 2 – mark 1) × mark 1 + 5000
= 9960/(20020-20000) × 20000 + 5000
= 9965000
-9965000 (the reference position is on the negative side)

[Setting parameter No. 1883]
When it is difficult to measure the distance from the scale zero point to the reference position (parameter No. 1883), the method described below can be used to find the distance.

<1> Set parameter No. 1815 to enable this function.
Set an appropriate value in parameter No. 1821 and No. 1882.
Set 0 in parameter No. 1240.
Set 0 in parameter No. 1883 and No. 1884.

<2> At an appropriate position, establish a reference position according to the method described in Subsection 1.2.1, "Procedure for Reference Position Establishment".

(As a result, the machine coordinate represents the distance from the scale zero point to the current position.)

<3> By jog feed or handle feed, place the machine at the accurate reference position.

<4> In parameter No. 1883, set the machine coordinate of that time converted to the detection unit (machine coordinate × CMR).

<5> If necessary, set parameter No. 1240.

* If the distance from the scale zero point to the reference position exceeds 999,999,999, this method cannot be used.

1885	Maximum allowable value for total travel during torque control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

Set a maximum allowable cumulative travel value (error counter value) during torque control. If the cumulative travel value exceeds the set value, the servo alarm (SV0423) is issued.

> **NOTE**
> This parameter is enabled when the parameter TQF (bit 4 of No.1803) is 0 (follow-up is not performed during torque control).

1886	Positional deviation when torque control is canceled

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 1 to 32767

Set a positional deviation value when torque control is canceled to return to positional deviation. After the positional deviation has fallen to the parameter-set value, switching to position control is performed.

> **NOTE**
> This parameter is enabled when the parameter TQF (bit 4 of No.1803) is 0 (follow-up is not performed during torque control).

	#7	#6	#5	#4	#3	#2	#1	#0
1902							ASE	FMD

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 FMD The FSSB setting mode is:
0: Automatic setting mode.
(When the relationship between an axis and amplifier is defined on the FSSB setting screen, parameter Nos. 1023, 1905, 1936 to 1939, and 14340 to 14407 (plus parameter Nos. 14408 to 14425 and 14444 to 14459 if an additional axis board is attached) are automatically set.
1: Manual setting 2 mode.
(Parameter Nos. 1023, 1905, 1936 to 1939 and 14340 to 14407 (plus parameter Nos. 14408 to 14425 and 14444 to 14459 if an additional axis board is attached) are to be manually set.)

 # 1 ASE When automatic setting mode is selected for FSSB setting (when the FMD parameter (bit 0 of parameter No.1902) is set to 0), automatic setting is:
0: Not completed.
1: Completed.
This bit is automatically set to 1 upon the completion of automatic setting.

	#7	#6	#5	#4	#3	#2	#1	#0
1905	PM2	PM1				PM4	PM3	

[Input type] Parameter input
[Data type] Bit axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 1 PM3 The third separate detector interface unit is:
0: Not used.
1: Used.

 # 2 PM4 The fourth separate detector interface unit is:
0: Not used.
1: Used.

 # 6 PM1 The first separate detector interface unit is:
0: Not used.
1: Used.

 # 7 PM2 The second separate detector interface unit is:
0: Not used.
1: Used.

> **NOTE**
> When automatic setting mode is selected for FSSB setting (when the parameter FMD (No.1902#0) is set to 0), this parameter is automatically set when input is performed with the FSSB setting screen. When manual setting 2 mode is selected for FSSB setting (when the parameter FMD (No.1902#0) is set to 1), this parameter must be set directly. When a separate detector interface unit is used, a connector number must be set in the corresponding parameter (No.1936, No.1937, No.1938, or No.1939).

1936	Connector number of the first separate detector interface unit
1937	Connector number of the second separate detector interface unit
1938	Connector number of the third separate detector interface unit
1939	Connector number of the fourth separate detector interface unit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 7

Set the connector numbers corresponding to connectors to be connected when the separate detector interface unit set by bit 1, 2, 6, or 7 of parameter No. 1905 is used. The values to be set are indicated below.
Within one separate detector interface unit, use connector numbers sequentially. No intermediate number may be omitted.

Correspondence between connectors and connector numbers	
Connector	**Connector number**
JF101	0
JF102	1
JF103	2
JF104	3
JF105	4
JF106	5
JF107	6
JF108	7

Example of setting)

	Separate detector connection destination				Parameter setting				
Controlled axis	**Connectors for 1st unit**	**Connectors for 2nd unit**	**Connectors for 3rd unit**	**Connectors for 4th unit**	**No. 1936**	**No. 1937**	**No. 1938**	**No. 1939**	**No.1905 (#7,#6,#2,#1)**
X1	JF101	-	-	-	0	-	-	-	0,1,0,0
Y1	-	JF102	-	-	-	1	-	-	1,0,0,0
Z1	-	-	JF102	-	-	-	1	-	0,0,0,1
X2	-	JF101	-	-	-	0	-	-	1,0,0,0
Y2	-	-	-	JF101	-	-	-	0	0,0,1,0
Z2	-	-	-	-	-	-	-	-	0,0,0,0
A1	-	-	JF101	-	-	-	0	-	0,0,0,1
B1	-	-	-	JF102	-	-	-	1	0,0,1,0
C1	-	JF104	-	-	-	3	-	-	1,0,0,0
A2	JF102	-	-	-	1	-	-	-	0,1,0,0
B2	-	JF103	-	-	-	2	-	-	1,0,0,0
C2	-	-	-	JF103	-	-	-	2	0,0,1,0

NOTE

When automatic setting mode is selected for FSSB setting (when the parameter FMD (No.1902#0) is set to 0), these parameters are automatically set when input is performed with the FSSB setting screen.
When manual setting 2 mode is selected for FSSB setting (when the parameter FMD (No.1902#0) is set to 1), these parameters must be set directly.

Parameters No.2000 to 2999 are for digital servo, The following parameters are not explained in this manual. Refer to FANUC AC SERVO MOTOR αi series PARAMETER MANUAL (B-65270EN)

No.	Data type	Contents							
2000	Bit axis				PGEX	PRMC		DGPR	PLC0
2001	Bit axis	AMR7	AMR6	AMR5	AMR4	AMR3	AMR2	AMR1	AMR0
2002	Bit axis	VFSE				PFSE			
2003	Bit axis	V0FS	OVSC	BLEN	NPSP	PIEN	OBEN	TGAL	
2004	Bit axis		DLY0			TRW1	TRW0	TIB0	TIA0
2005	Bit axis	SFCM	BRKC					FEED	
2006	Bit axis		DCBE		ACCF	SPVE	PKVE	SBSM	FCBL
2007	Bit axis	FRCA							
2008	Bit axis	LAXD	PFBS	VCTM	SPPC	SPPR	VFBA	TNDM	
2009	Bit axis	BLST	BLCU				ADBL	IQOB	SERD
2010	Bit axis	POLE		HBBL	HBPE	BLTE	LINE		
2011	Bit axis	XIA		RCCL				FFALWY	SYNMOD
2012	Bit axis	STNG		VCM2	VCM1			MSFE	
2013	Bit axis	APTG							
2014	Bit axis	(Reserve)							
2015	Bit axis	BZNG	BLAT	TDOU				SSG1	PGTW
2016	Bit axis					K2VC			ABNT
2017	Bit axis	PK25	OVCR	RISC	HTNG				DBST
2018	Bit axis	PFBC						MOVO	REVS
2019	Bit axis	DPFB			SPSY				
2020	Word axis	Motor number							
2021	Word axis	Load inertia ratio							
2022	Word axis	Direction of motor rotation							
2023	Word axis	Number of velocity pulses							
2024	Word axis	Number of position pulses							
2028	Word axis	Position gain switching speed							
2029	Word axis	Effective speed for integral acceleration at low speed							
2030	Word axis	Effective speed for integral deceleration at low speed							
2033	Word axis	Position feedback pulse							
2034	Word axis	Damping control gain							
2039	Word axis	Second-stage acceleration for two-stage backlash acceleration							
2040	Word axis	Current loop integral gain (PK1)							
2041	Word axis	Current loop proportional gain (PK2)							
2042	Word axis	Current loop gain (PK3)							
2043	Word axis	Velocity loop integral gain (PK1V)							
2044	Word axis	Velocity loop proportional gain (PK2V)							
2045	Word axis	Velocity loop incomplete integral gain (PK3V)							
2046	Word axis	Velocity loop gain (PK4V)							
2047	Word axis	Observer parameter (POA1)							
2048	Word axis	Backlash acceleration							
2049	Word axis	Maximum amplitude for dual position feedback							
2050	Word axis	Observer parameter (POK1)							
2051	Word axis	Observer parameter (POK2)							
2053	Word axis	Current dead zone compensation (PPMAX)							
2054	Word axis	Current dead zone compensation (PDDP)							
2055	Word axis	Current dead zone compensation (PHYST)							
2056	Word axis	Counterectromotive force compensation (EMFCMP)							

No.	Data type	Contents
2057	Word axis	Current phase lead compensation (PVPA)
2058	Word axis	Current phase lead compensation (PALPH)
2059	Word axis	Counterelectromotive force compensation (EMFBAS)
2060	Word axis	Torque limit
2061	Word axis	Counterelectromotive force compensation (EMFLMT)
2062	Word axis	Overload protection coefficient (OVC1)
2063	Word axis	Overload protection coefficient (OVC2)
2064	Word axis	Soft disconnection alarm level
2065	Word axis	Overload protection coefficient (OVCLMT)
2066	Word axis	250-μs acceleration feedback
2067	Word axis	Torque command filter
2068	Word axis	Feed forward coefficient
2069	Word axis	Velocity feed forward coefficient
2070	Word axis	Backlash acceleration timing
2071	Word axis	Backlash acceleration effective duration
2072	Word axis	Static friction compensation
2073	Word axis	Stop judgment parameter
2074	Word axis	Velocity-dependent current loop gain
2077	Word axis	Overshoot prevention counter
2078	Word axis	Conversion coefficient for dual position feedback (numerator)
2079	Word axis	Conversion coefficient for dual position feedback (denominator)
2080	Word axis	First-order lag time constant for dual position feedback
2081	Word axis	Zero width for dual position feedback
2082	Word axis	Backlash acceleration stop amount
2083	Word axis	Brake control timer (ms)
2084	Word axis	Flexible feed gear (numerator)
2085	Word axis	Flexible feed gear (denominator)
2086	Word axis	Rated current parameter
2087	Word axis	Torque offset
2088	Word axis	Machine velocity feedback coefficient gain
2089	Word axis	Backlash acceleration base pulse
2091	Word axis	Non-linear control parameter
2092	Word axis	Advanced preview feed forward coefficient
2097	Word axis	Static friction compensation stop parameter
2098	Word axis	Current phase lead compensation coefficient
2099	Word axis	N-pulse suppression level
2101	Word axis	Overshoot compensation effective level
2102	Word axis	Final clamp value for actual current limit
2103	Word axis	Amount of track back upon detection of unexpected disturbance torque
2104	Word axis	Threshold for detecting abnormal load during cutting
2105	Word axis	Torque constant
2107	Word axis	Velocity loop gain override
2110	Word axis	Magnetic saturation compensation (base/coefficient)
2111	Word axis	Deceleration torque limit (base/coefficient)
2112	Word axis	AMR conversion coefficient 1
2113	Word axis	Notch filter center frequency (Hz)
2114	Word axis	Stage 2 acceleration amount override for two-stage backlash acceleration
2116	Word axis	Unexpected disturbance torque detection, dynamic friction compensation value
2118	Word axis	Excessive error level between semi-closed and closed loops for dual position feedback
2119	Word axis	Stop level with variable proportional gain
2121	Word axis	Conversion coefficient for number of feedback pulses

No.	Data type	Contents							
2122	Word axis	Conversion coefficient for detected resistance							
2126	Word axis	Tandem control , time constant for switching position feedback							
2127	Word axis	Non-interacting control coefficient							
2128	Word axis	Weak magnetic flux compensation (coefficient)							
2129	Word axis	Weak magnetic flux compensation (base/limit)							
2130	Word axis	Two thrust ripple compensations per magnetic pole pair							
2131	Word axis	Four thrust ripple compensations per magnetic pole pair							
2132	Word axis	Six thrust ripple compensations per magnetic pole pair							
2133	Word axis	Deceleration phase delay compensation coefficient (PHDLY1)							
2134	Word axis	Deceleration phase delay compensation coefficient (PHDLY2)							
2137	Word axis	Stage 1 acceleration amount override for two-stage backlash acceleration							
2138	Word axis	Linear motor AMR conversion coefficient 2							
2139	Word axis	Linear motor AMR offset							
2142	Word axis	Threshold for detecting abnormal load during rapid traverse							
2144	Word axis	Position feed forward coefficient for cutting							
2145	Word axis	Velocity feed forward coefficient for cutting							
2146	Word axis	Two-stage backlash acceleration end timer							
2148	Word axis	Deceleration decision level (HRV control)							
2154	Word axis	Static friction compensation function. Decision level for movement restart after stop.							
2156	Word axis	Torque command filter (at cutting)							
2162	Word axis	Second overload protection coefficient (POVC21)							
2163	Word axis	Second overload protection coefficient (POVC22)							
2164	Word axis	Second overload protection coefficient (POVCLMT2)							
2165	Word axis	Maximum amplifier current							
2167	Word axis	Stage 2 acceleration amount offset for two-stage backlash acceleration							
2177	Word axis	Damping filter limit bandwidth (Hz)							
2180	Word axis	Linear motor thrust ripple correction.							
2185	Word axis	Position pulse conversion coefficient							
2200	Bit axis		P2EX			ABGO	IQOB		OVSP
2201	Bit axis		CPEE		SPVC			RNVL	CROF
2202	Bit axis				DUAL	OVS1	PIAL	VGCG	
2203	Bit axis				FRC2		1/2PI		
2204	Bit axis	ERC0		PGW2					
2205	Bit axis						FLDY		
2206	Bit axis	HSSR							
2207	Bit axis		SWFDB			PD50			
2210	Bit axis						PKGA		
2211	Bit axis							PHCP	
2212	Bit axis	OVQK							

	#7	#6	#5	#4	#3	#2	#1	#0
2008						VFA	TDM	

[Input type] Parameter input
[Data type] Bit axis

 # 1 TDM This bit is automatically set to 1 when bit 6 (tandem axis) of parameter No. 1817 is set to 1.
This bit cannot be directly set.

 # 2 VFA In tandem control, the feedrate feedback average function is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
2011	XIAx							

[Input type] Parameter input
[Data type] Bit axis

 # 7 XIAx Temporary absolute coordinate setting is:
0: Not used.
1: Used.

NOTE
1 When temporary absolute coordinate setting is used, bit 1 (OPTx) of parameter No. 1815, bit 5 (APCx) of parameter No. 1815, parameter No. 1874, and parameter No. 1875 must be set.
2 The setting of this parameter becomes effective after the power is turned off then back on.

2021	Load inertia ratio

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 32767
(Load inertia)/(motor inertia) × 256

For tandem control:
(Load inertia)/(motor inertia) × 256/2
Set the same value for the master axis and slave axis.

2087	Preload value for each axis (Tcmd offset)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] (Ampere limit)/7282
[Valid data range] -1821 to 1821

An offset is applied to a torque command to suppress backlash.
Set a value much greater than the friction.
As a guideline, specify a value that is about one-third of the rated torque.

[Example]

To set a torque equivalent to 3 A in the opposite directions:
When the ampere limit is 40 A
3/(40/7282) = 546
Master side = 546
Slave side = -546

4.15 PARAMETERS OF DI/DO

	#7	#6	#5	#4	#3	#2	#1	#0
3001	MHI						SON	

[Input type] Parameter input
[Data type] Bit path

 # 1 SON Automatic operation is started:
0: On the falling edge ("1" → "0") of the automatic operation start signal ST
1: On the rising edge ("0" → "1") of the of the automatic operation start signal ST

 # 7 MHI Exchange of strobe and completion signals for the M, S, T, and B
0: Normal
1: High-speed

	#7	#6	#5	#4	#3	#2	#1	#0
3002				IOV				

[Input type] Parameter input
[Data type] Bit path

 # 4 IOV Override-related signal logic is:
0: Used without modification
(A signal of negative logic is used as a negative logic signal, and a signal of positive logic is used as a positive logic signal.)
1: Inverted
(A signal of negative logic is used as a positive logic signal, and a signal of positive logic is used as a negative logic signal.)
The signals indicated below are affected.
Signal of negative logic:
Feedrate override signals *FV0 to *FV7<G0012>
Second feedrate override signals*AFV0 to *AFV7<G0013>
Feedrate override signals (for PMC axis control)
*EFOV0g to *EFOV7g<G0151/G0163/G0175/G0187>
Software operator's panel signals *FV0O to *FV7O<F0078>
Signals of positive logic:
Rapid traverse override signals ROV1,ROV2<G0014 bit0,bit1>
Software operator's panel signals ROV1O,ROV2O<F0076 bit4,bit5>
Rapid traverse override signals (for PMC axis control)
EROV1g,EROV2g<G0150#0, #1, G0162#0, #1, G0174 #0, #1, G0186#0, #1>

		#7	#6	#5	#4	#3	#2	#1	#0
3003				DEC	DAU	DIT	ITX		ITL
				DEC		DIT	ITX		ITL

[Input type] Parameter input
[Data type] Bit path

 # 0 ITL Interlock signal for all axes
0: Enabled
1: Disabled

 # 2 ITX Interlock signals for each axis
0: Enabled
1: Disabled

 # 3 DIT The interlock signal for each axis direction is:
0: Valid.
1: Invalid.

 # 4 DAU When bit 3 (DIT) of parameter No. 3003 is set to 0, the interlock signal for each axis direction is:
0: Valid only in manual operation, and invalid in automatic operation.
1: Valid in either manual operation or automatic operation.

 # 5 DEC Deceleration signal (*DEC1 to *DEC8) for reference position return
0: Deceleration is applied when the signal is 0.
1: Deceleration is applied when the signal is 1.

		#7	#6	#5	#4	#3	#2	#1	#0
3004				OTH				BCY	BSL

[Input type] Parameter input
[Data type] Bit path

 # 0 BSL The block start interlock signal (*BSL) and cutting block start interlock signal (*CSL) are:
0: Disabled.
1: Enabled.

 # 1 BCY When more than one operation is performed by one block command such as a canned cycle, the block start interlock signal (*BSL) is:
0: Checked only at the beginning of the first cycle.
1: Checked at the beginning of every cycle.

 # 5 OTH The overtravel limit signal is:
0: Checked
1: Not checked

⚠ WARNING

For safety, usually set 0 to check the overtravel limit signal.

	#7	#6	#5	#4	#3	#2	#1	#0
3006					EP2	EPS	EPN	GDC

[Input type] Parameter input
[Data type] Bit

 # 0 GDC As the deceleration signal for reference position return:
0: X0009 is used.
1: G0196 is used. (X0009 is disabled.)

 # 1 EPN In external workpiece number search, signals for workpiece number specification are selected.
The following signal selections are made by combining this parameter with bit 3 (EP2) of parameter No. 3006:

EP2	EPN	Signals
0	0	The external workpiece search signals (PN1 to PN16) are used. (A number from 1 to 31 can be specified.)
0	1	The extended external workpiece number search signals (EPN0 to EPN13) are used. (A number from 1 to 9999 can be specified.)
1	0	The extended external workpiece number search signals (EWN0 to EWN26) are used. (A number from 1 to 99999999 can be specified.)

 # 2 EPS As the signal for starting external workpiece number search:
0: The automatic operation start signal ST is used. When automatic operation (memory operation) is started, a search is made.
1: The external workpiece number search start signal EPNS is used. ST does not start a search.

 # 3 EP2 In external workpiece number search, signals for workpiece number specification are selected. See the description of bit 1 (EPN) of parameter No. 3006.

	#7	#6	#5	#4	#3	#2	#1	#0
3008						XSG		

[Input type] Parameter input
[Data type] Bit path

NOTE
When this parameter is set, the power must be turned off before operation is continued.

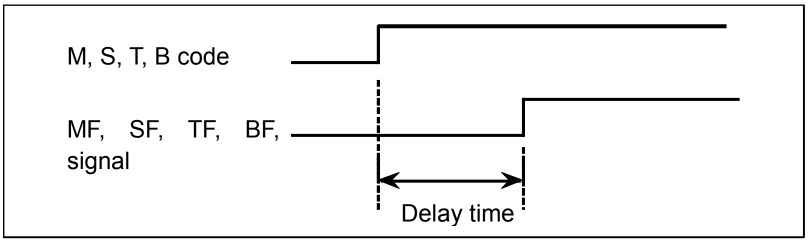
 # 2 XSG A signal assigned to an X address is:
0: Fixed at the address.
1: Able to be reassigned to an arbitrary X address.

NOTE
When this parameter is set to 1, set parameter No. 3013, No. 3014, No. 3012, and No. 3019. If parameter No. 3013 and No. 3014 are not set, the deceleration signal for reference position return is assigned to bit 0 of X0000. If parameter No. 3012 and No. 3019 are not set, the skip signal, the PMC axis control skip signal, the measurement position arrival signal, the manual feed interlock signal for each axis direction, and the tool compensation value write signal are assigned to X0000.

3010	Time lag in strobe signals MF, SF, TF, and BUFFER

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767

The time required to send strobe signals MF, SF, TF, and BF after the M, S, T, and B codes are sent, respectively.

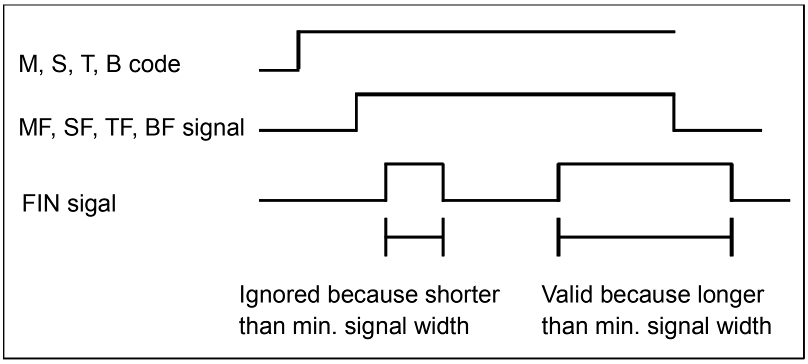


NOTE
The time is counted in units of 4 ms. If the set value is not a multiple of four, it is raised to the next multiple of four
Example
When 30 is set, 32 ms is assumed.
When 0 is set, 4 ms is assumed.
The time count period may change, depending on the system.

3011	Acceptable width of M, S, T, and B function completion signal (FIN)

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767

Set the minimum signal width of the valid M, S, T, and B function completion signal (FIN).



NOTE
The time is counted in units of 4 ms. If the set value is not a multiple of four, it is raised to the next multiple of four
Example
When 30 is set, 32 ms is assumed.
When 0 is set, 4 ms is assumed.
The time count period may change, depending on the system.

3012	Skip signal assignment address

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 727
Set an X address to which the skip signal (SKIPn) is to be assigned.

NOTE
This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.
Depending on the option configuration of the I/O Link, the actually usable X addresses are:
X0 to X127, X200 to X327, X400 to X527, X600 to X727

3013	X address to which the deceleration signal for reference position return is assigned

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 727

Set an address to which the deceleration signal (*DECn) for reference position return for each axis is to be assigned.

> **NOTE**
> This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.
> Depending on the option configuration of the I/O Link, the actually usable X addresses are:
> X0 to X127, X200 to X327, X400 to X527, X600 to X727

3014	Bit position of an X address to which the deceleration signal for reference position return is assigned

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 7

Set a bit position to which the deceleration signal for reference position return (*DECn) for each axis is to be assigned.

> **NOTE**
> This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.

3017	Output time of reset signal RST

[Input type] Parameter input
[Data type] Word path
[Unit of data] 16msec
[Valid data range] 0 to 255

When the output time of the reset signal RST is to be extended, set an extended time.

(RST signal output time) =
(Time required for reset processing) + (Parameter setting) × 16 msec

3019	Address to which the PMC axis control skip signal and the measurement position arrival signal are assigned

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 727

Set an X address to which the PMC axis control skip signal ESKIP and the measurement position arrival signals (XAE, YAE, and ZAE (M series) or XAE and ZAE (T series)) are to be assigned.

Example 1. When No.3012 is set to 5 and No.3019 is set to 6

When XSG (bit 2 of parameter No. 3008) is 1, the PMC axis control skip signal, and measurement position arrival signal are allocated to X0006 and the skip signal is allocated to X0005.

	#7	#6	#5	#4	#3	#2	#1	#0	
X005	SKIP	SKIP6	SKIP5	SKIP4	SKIP3	SKIP2	SKIP8	SKIP7	(T series)
	SKIP	SKIP6	SKIP5	SKIP4	SKIP3	SKIP2	SKIP8	SKIP7	(M series)

	#7	#6	#5	#4	#3	#2	#1	#0	
X006		ESKIP	-MIT2	+MIT2	-MIT1	+MIT1	ZAE	XAE	(T series)
		ESKIP				ZAE	YAE	XAE	(M series)

Example 2. When No.3012 is set to 5 and No.3019 is set to 5

When XSG (bit 2 of parameter No. 3008) is 1, the PMC axis control skip signal, measurement position arrival signal, and skip signal are allocated to X0005.

	#7	#6	#5	#4	#3	#2	#1	#0	
X005	SKIP	ESKIP SKIP6	-MIT2 SKIP5	+MIT2 SKIP4	-MIT1 SKIP3	+MIT1 SKIP2	ZAE SKIP8	XAE SKIP7	(T series)
	SKIP	ESKIP SKIP6	SKIP5	SKIP4	SKIP3	ZAE SKIP2	YAE SKIP8	XAE SKIP7	(M series)

NOTE
This parameter is valid when bit 2 (XSG) of parameter No. 3008 is set to 1.
Depending on the option configuration of the I/O Link, the actually usable X addresses are:
X0 to X127, X200 to X327, X400 to X527, X600 to X727

3020	Correspondence between workpiece numbers and program numbers in external workpiece number search (PN)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] -1 to 999999

This parameter has the following meaning according to the value set.

- When a value from 0 to 999999 is set
  (Program number) = (setting)*100+(workpiece number)
  This means that the setting specifies the higher 6 digits of a program number.
- When the value -1 is set
  The higher 6 digits of a program number represent the minimum of the existing program numbers.

Example

When workpiece number 21 is specified, program numbers such as O0021, O0121, and O0221 are searched for. If O0021 is not found, but O0121 and O0221 are found, O0121 is selected as the program number.

> **NOTE**
> This parameter is valid when a workpiece number is specified using the PN1 to PN16 signals (when parameter bits EP2, EPN = 0, 0).

3021	Address to which an axis signal is assigned

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 7, 10 to 17, 20 to 27, ... , 90 to 97

For each axis of the CNC, set a PMC interface address.
Set a value according to the tables below.

Value of parameter No. 3021 (tens digit)

Setting value	Input signal address	Output signal address
0	G0000 to G0999	F0000 to F0999
1	G1000 to G1999	F1000 to F1999
	:	
9	G9000 to G9999	F9000 to F9999

Value of parameter No. 3021 (ones digit)

Setting value	Input signal address	Output signal address
0	#0	#0
1	#1	#1
	:	
7	#7	#7

[Example of setting]

Axis number	No.3021	Signal allocation

1	0	+J1<G0100.0>, -J1<G0102.0>, ZP1<F0090.0>, ...
2	1	+J2<G0100.1>, -J2<G0102.1>, ZP2<F0090.1>, ...
3	2	+J3<G0100.2>, -J3<G0102.2>, ZP3<F0090.2>, ...
4	10	+J4<G1100.0>, -J4<G1102.0>, ZP4<F1090.0>, ...
5	11	+J5<G1100.1>, -J5<G1102.1>, ZP5<F1090.1>, ...

If eight or less axes are used per path, the following signal allocation results when 0 is set for all axes:

Axis 1 of path 1 = Setting equivalent to 0
Axis 2 of path 1 = Setting equivalent to 1
:
Axis 1 of path 2 = Setting equivalent to 10
:

NOTE

Set this parameter when more than eight axes are used per path.
The valid data range varies, depending on the NC system type.

3022	Address to which a spindle signal is assigned

NOTE

When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0to3,10to13,20to23, ... ,90to93

For each axis of the CNC, set a PMC interface address.
Set a value according to the tables below.

Value of parameter No. 3022 (tens digit)

Setting value	Input signal address	Output signal address
0	G0000toG0999	F0000toF0999
1	G1000toG1999	F1000toF1999
	:	
9	G9000toG9999	F9000toF9999

Value of parameter No. 3022 (ones digit)

Setting value	Input signal address	Output signal address
0	Bit position A	Bit position A
1	Bit position B	Bit position B
2	Bit position C	Bit position C
3	Bit position D	Bit position D

(The bit positions A, B, C, and D vary, depending on the type of signal.)

[Example of setting]

Spindle	No.3022	Signal allocation

number		
1	0	TLMLA<G0070.0>, TLMHA<G0070.1>, ALMA<F0045.0>, ...
2	1	TLMLB<G0074.0>, TLMHB<G0074.1>, ALMB<F0049.0>, ...
3	10	TLMLA<G1070.0>, TLMHA<G1070.1>, ALMA<F1045.0>, ...
4	11	TLMLB<G1074.0>, TLMHB<G1074.1>, ALMB<F1049.0>, ...

If four or less axes are used per path, the following signal allocation results when 0 is set for all axes:

Axis 1 of path 1 = Setting equivalent to 0
Axis 2 of path 1 = Setting equivalent to 1
:
Axis 1 of path 2 = Setting equivalent to 10
:

NOTE
Set this parameter when more than four axes are used per path.
The valid data range varies, depending on the system software.

3030	Allowable number of digits for the M code

3031	Allowable number of digits for the S code

3032	Allowable number of digits for the T code

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 8

Set the allowable numbers of digits for the M, S, and T codes.
When 0 is set, the allowable number of digits is assumed to be 8.

3033	Allowable number of digits for the B code (second auxiliary function)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 8

Set the allowable number of digits for the second auxiliary function.
When 0 is set, the allowable number of digits is assumed to be 8.
To enable a decimal point to be specified, bit 0 (AUP) of parameter No. 3450 must be set to 1. In this case, the allowable number of digits set in this parameter includes the number of decimal places.
If a value exceeding the allowable number of digits is specified, the alarm (PS0003) is issued.

4.16 PARAMETERS OF DISPLAY AND EDIT (1/2)

	#7	#6	#5	#4	#3	#2	#1	#0
3101							KBF	

[Input type] Parameter input
[Data type] Bit

 # 1 KBF When the screen or mode is changed, the contents of the key-in buffer are:
0: Cleared.
1: Not cleared.

	#7	#6	#5	#4	#3	#2	#1	#0
3104	DAC				PPD			MCN
	DAC	DAL		DRL	PPD			MCN

[Input type] Parameter input
[Data type] Bit path

 # 0 MCN Machine position
0: Regardless of whether input is made in mm or inches, the machine position is displayed in mm for millimeter machines, or in inches for inch machines.
1: When input is made in mm, the machine position is displayed in mm, and when input is made in inches, the machine position is displayed in inches accordingly.

 # 3 PPD Relative position display when a coordinate system is set
0: Not preset
1: Preset

> **NOTE**
> If any of the following is executed when PPD is set to 1, the relative position display is preset to the same value as the absolute position display:
> (1) Manual reference position return
> (2) Coordinate system setting based on G92 (G50 for G code system A on the lathe system)
> (3) Workpiece coordinate system presetting based on G92.1 (G50.3 for G code system A on the lath system)
> (4) When a T code for the lathe system is specified, the relative position display is preset to the same value as the absolute position display.

 # 4 DRL Relative position
0: The actual position displayed takes into account tool length offset.
1: The programmed position displayed does not take into account tool length offset.

 # 6 DAL Absolute position
0: The actual position displayed takes into account tool length offset.
1: The programmed position displayed does not take into account tool length offset.

 # 7 DAC When a relative position and absolute position are displayed:
0: Values not excluding the amount of travel based on cutter compensation and tool nose radius compensation are displayed.
1: Values excluding the amount of travel based on cutter compensation and tool nose radius compensation (programmed positions) are displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3105						DPS		DPF

[Input type] Parameter input
[Data type] Bit path

 # 0 DPF The actual speed is:
0: Not displayed
1: Displayed

 # 2 DPS The actual spindle speed is:
0: Not displayed
1: Displayed

	#7	#6	#5	#4	#3	#2	#1	#0
3106		DAK	SOV	OPH				

[Input type] Setting input
[Data type] Bit

 # 4 OPH The operation history screen is:
0: Not displayed.
1: Displayed.

 # 5 SOV A spindle override value is:
0: Not displayed.
1: Displayed.

NOTE
This parameter is valid only when bit 2 (DPS) of parameter No. 3105 is set o 1.

 # 6 DAK When absolute coordinates are displayed in the three-dimensional coordinate conversion mode:
0: Coordinates in the program coordinate system are displayed.
1: Coordinates in the workpiece coordinate system are displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3108	JSP	SLM		WCI		PCT		

[Input type] Parameter input
[Data type] Bit path

 # 2 PCT For modal T display on the program check screen:
0: A specified T value is displayed.
1: HD.T and NX.T are displayed.
Values displayed follow bit 1 of parameter No. 13200.

 # 4 WCI On the workpiece coordinate system screen, a counter input is:
0: Disabled.
1: Enabled.

 # 6 SLM The spindle load meter is:
0: Not displayed.
1: Displayed.

NOTE
This parameter is valid only when bit 2 (DPS) of parameter No. 3105 is set to 1.

 # 7 JSP On the current position display screen and program check screen, jog feed is:
0: Not displayed.
1: Displayed.
In manual operation mode, the jog feedrate is displayed. In automatic operation mode, the dry run feedrate is displayed. In each case, the feedrate to which a manual feedrate override has been applied is displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3109						IKY	DWT	

[Input type] Parameter input
[Data type] Bit path

 # 1 DWT Characters G and W in the display of tool wear/geometry compensation amount
0: The characters are displayed at the left of each number.
1: The characters are not displayed.

 # 2 IKY On the tool offset screen and workpiece shift screen (T series), soft key [INPUT] is:
0: Displayed.

1: Not displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3111						SVP	SPS	SVS

[Input type] Setting input
[Data type] Bit path

 # 0 SVS Servo setting screen and servo tuning screen
0: Not displayed
1: Displayed

 # 1 SPS Spindle tuning screen
0: Not displayed
1: Displayed

 # 2 SVP Spindle synchronization errors displayed on the spindle tuning screen
0: Instantaneous values are displayed.
1: Peak-hold values are displayed.
Spindle synchronization errors are displayed on the side of the spindle that functions as a slave axis in spindle synchronization control.

	#7	#6	#5	#4	#3	#2	#1	#0
3112						OMH		

[Input type] Parameter input
[Data type] Common to the bit system

 # 2 OMH The external operator message history screen is:
0: Not displayed.
1: Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3113			DCL				ALP	

[Input type] Parameter input
[Data type] Bit

 # 1 ALP Alphabetic character input using soft keys is:
0: Disabled.
1: Enabled.

> **NOTE**
> This parameter is valid only with a 10.4-inch display unit.

 # 5 DCL The touch panel compensation screen is:
0: Disabled.
1: Enabled.
Set this parameter to 0 usually. Touch panel compensation becomes necessary only when the panel is replaced or memory all clear

operation is performed. Set this parameter to 1 only when performing touch panel compensation. Upon completion of compensation, set this parameter to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
3114		ICU	IGR	IMS	ISY	IOF	IPR	IPO

[Input type] Parameter input
[Data type] Bit

 # 0 IPO When the <POS> function key is pressed while the position display screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

 # 1 IPR When the <PROG> function key is pressed while the program screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

 # 2 IOF When the <OFFSET/SETTING> function key is pressed while the offset/setting screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

 # 3 ISY When the <SYSTEM> function key is pressed while the system screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

 # 4 IMS When the <MESSAGE> function key is pressed while the message screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

 # 5 IGR When the <GRAPH> function key is pressed while the custom or graphic screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

 # 6 ICU When the <CUSTOM> function key is pressed while the custom screen is being displayed:
0: The screen is changed.
1: The screen is not changed.

	#7	#6	#5	#4	#3	#2	#1	#0
3115			APLx		NDFx			

[Input type] Parameter input
[Data type] Bit axis

 # 3 NDFx In calculation for actual cutting feedrate display, the feedrate of a selected axis is:
0: Considered.
1: Not considered.

 # 5 APLx When the active offset value modification mode based on manual feed is selected, the relative position display is automatically:
0: Not preset.
1: Preset.
Use this parameter when returning a modified offset value to the original value before modification in the active offset value modification mode based on manual feed. The offset value can be returned to the original value by making a movement on the axis by manual feed so that the relative position display (counter) indicates the position 0.

	#7	#6	#5	#4	#3	#2	#1	#0
3119					TPA	DDS		

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 2 DDS The touch panel is:
0: Enabled.
1: Disabled.
Set this parameter to 1 when disabling the touch panel temporarily, for example, at start-up time.

 # 3 TPA When the option for the external touch panel interface is selected, the external touch panel interface connection is:
0: Valid.
1: Invalid.

As described in "Connection" above, RS-232C serial port 2 (JD36B or JD54) of the main CPU board on the CNC side is used for ETP.
When using ETP, set bit 3 (TPLDS) of parameter No. 3119 to 0.
By this setting, JD36B or JD54 is used for ETP, regardless of the setting of I/O CHANNEL（I/O device selection) of the existing parameters 20 (and 21 through 23).
For other I/O devices, use JD36A and so forth.

By the setting above, the settings of the existing parameters 100 and 121 through 123 become invalid for channel 2 (JD36B or JD54), and the following settings are applied at all times:

- Baud rate : 19200 bps
- Stop bit : 1 bit
- Parity check : Even parity

3122	Time interval used to record time data in operation history

[Input type] Parameter input
[Data type] Word path
[Unit of data] min
[Valid data range] 0 to 1440

When history data is recorded within a set time period, the time for each set time period is recorded in the history data.
When 0 is set, the specification of a time period of 10 minutes is assumed.

	#7	#6	#5	#4	#3	#2	#1	#0
3124	D08	D07	D06	D05	D04	D03	D02	D01

	#7	#6	#5	#4	#3	#2	#1	#0
3125	D16	D15	D14	D13	D12	D11	D10	D09

	#7	#6	#5	#4	#3	#2	#1	#0
3126	D24	D23	D22	D21	D20	D19	D18	D17

	#7	#6	#5	#4	#3	#2	#1	#0
3127	D32	D31	D30	D29	D28	D27	D26	D25

[Input type] Parameter input
[Data type] Bit path

D01～D32

Set a group of G codes to be displayed on the program check screen.
The table below indicates the correspondence between bits and G code groups.
The setting of a bit has the following meaning:
0: Displays the G code group corresponding to a bit.
1: Does not display the G code group corresponding to a bit.

Parameter	G code group
D01	01
D02	02
D03	03
:	:
D32	32

3128	Retracement time for deleting alarm data from the alarm history

[Input type] Parameter input
[Data type] Word path
[Unit of data] sec
[Valid data range] 0 to 255

From the alarm history, the alarm data that occurred during a set period of time back from the power-off time is deleted.
When 0 is set, a retracement time of 1 second is assumed to be specified.

	#7	#6	#5	#4	#3	#2	#1	#0
3129						MRE	DAP	DRP
						MRE		

[Input type] Parameter input
[Data type] Bit path

 # 0 DRP For relative coordinate display:
0: The actual position considering a tool offset (tool movement) is displayed.
1: The programmed position excluding a tool offset (tool movement) is displayed.

 # 1 DAP For absolute coordinate display:
0: The actual position considering a tool offset (tool movement) is displayed.
1: The programmed position excluding a tool offset (tool movement) is displayed.

 # 2 MRE When mirror image is used, relative coordinates are:
0: Updated with respect to the machine coordinates.
1: Updated with respect to the absolute coordinates.

Set this parameter to 1 when handling relative coordinates in the same way as for the lathe system of the FS16*i*/18*i*/21*i*.

3131	Subscript of axis name

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 9, 65 to 90

In order to distinguish axes under parallel operation, synchronization control, and tandem control, specify a subscript for each axis name.

Setting value	Meaning
0	Each axis is set as an axis other than a parallel axis, synchronization control axis, and tandem control axis.
1 to 9	A set value is used as a subscript.
65 to 90	A set letter (ASCII code) is used as a subscript.

Example) When the axis name is X, a subscript is added as indicated below.

Setting value	Axis name displayed on a screen such as the position display screen
0	X
1	X1
77	XM
83	XS

If a multi-path system is used, no extended axis name is used within a path, and no subscript is set for the axis names, then the path number is automatically used as the subscript for the axis names. To disable the display of axis name subscripts, set a blank (32) of ASCII code in the parameter for specifying an axis name subscript.

NOTE
If an extended axis name is used even for one axis within a path, the use of an axis name subscript becomes impossible within the path.

3132	Axis name (absolute coordinate) for current position display

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 255

These parameters set the axis name for current position display.
When G code system B or C is used, the axis name set in parameter No.3132 is used for both absolute and relative coordinate axes.
The values set in these parameters are used only for display.
When 0 is set in this parameter, the setting of parameter No. 1020 is used.
When an extended axis name is used, only the first character displayed is replaced.

3133	Axis name (relative coordinate) for current position display

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 255

These parameters set the axis name for current position display.
When G code system B or C is used, the axis name set in parameter No.3132 is used for both absolute and relative coordinate axes.
The values set in these parameters are used only for display.
When 0 is set in this parameter, the setting of parameter No. 1020 is used.
When an extended axis name is used, only the first character displayed is replaced.

3134	Data display order of each axis on the workpiece coordinate system setting screen and workpiece coordinate system shift amount setting screen

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to Number of controlled axes

Set the data display order of each axis on the workpiece coordinate system setting screen (M series/T series) and workpiece coordinate system shift amount setting screen (T series).
No data is displayed for an axis with 0 set in this parameter.

3135	Number of decimal places in actual feedrate display

[Input type] Setting input
[Data type] Byte path
[Valid data range] 0 to 3

Set the number of decimal places in actual feedrate display.
In the case of inch input, the number of decimal places is a set value plus 2.

Setting value

0 :	Metric input	Displayed without a decimal point
	Inch input	Displayed using the second decimal place
1 :	Metric input	Displayed using the first decimal place
	Inch input	Displayed using the third decimal place
2 :	Metric input	Displayed using the second decimal place
	Inch input	Displayed using the fourth decimal place
3 :	Metric input	Displayed using the third decimal place
	Inch input	Displayed using the fifth decimal place

3141	Path name (1st character)

3142	Path name (2nd character)

3143	Path name (3rd character)

3144	Path name (4th character)

3145	Path name (5th character)

3146	Path name (6th character)

3147	Path name (7th character)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] See the character-code correspondence table.

Specify a path name with codes.

Any character string consisting of alphanumeric characters, katakana characters, and special characters with a maximum length of seven characters can be displayed as a series name.

NOTE
1 For characters and codes, see the correspondence table in Appendix A.
2 When 0 is set in parameter No. 3141, PATH1(,PATH2...) are displayed as path names.

3151	Axis number of the load meter for the first servo motor

3152	Axis number of the load meter for the second servo motor

3160	Setting of MDI unit type

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 4
Set the type of an MDI unit when the type of an MDI unit is not automatically identified.

Setting value	Type
0	Depends on the system type and indicator type.
1	Standard MDI unit for the lathe system
2	Standard MDI unit for the machining center system
3	Small MDI unit for the lathe system
4	Small MDI unit for the machining center system

When 0 is set in this parameter, the type of a MDI unit is determined as follows:

Type of path control	Type of indicator	Type
When the type for the lathe system is used with path 1	Type of 12 horizontal soft keys	Standard MDI unit for the lathe system
	Type of 7 horizontal soft keys	Small MDI unit for the lathe system
When the type for the machining center system is used with path 1	Type of 12 horizontal soft keys	Standard MDI unit for the machining center system
	Type of 7 horizontal soft keys	Small MDI unit for the machining center system

	#7	#6	#5	#4	#3	#2	#1	#0
3191					SSF	WSI		

[Input type] Parameter input
[Data type] Bit path

 # 2 WSI On the workpiece zero point offset screen, the soft key [INPUT] is:
0: Displayed.
1: Not displayed.

 # 3 SSF On the setting screen, the soft key for confirming data input is:
0: Not displayed.

1: Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3194					DPM	DPA		

[Input type] Parameter input
[Data type] Bit path

 # 2 DPA The absolute coordinates, relative coordinates, and remaining move amount during diameter/radius specification switching are displayed:
0: According to the specification during switching.
1: According to the setting of bit 3 (DIAx) of parameter No. 1006.

 # 3 DPM The machine coordinates during diameter/radius specification switching are displayed:
0: According to the setting of bit 3 (DIAx) of parameter No. 1006.
1: According to the specification during switching.

	#7	#6	#5	#4	#3	#2	#1	#0
3195	EKE	HDE	HKE					

[Input type] Parameter input
[Data type] Common to the bit system

 # 5 HKE A key operation history is:
0: Recorded.
1: Not recorded.

 # 6 HDE A DI/DO history is:
0: Recorded.
1: Not recorded.

 # 7 EKE The [ALL CLEAR] soft key for clearing all history data is:
0: Not displayed.
1: Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3201		NPE	N99			REP		

[Input type] Parameter input
[Data type] Bit path

 # 2 REP Action in response to an attempt to register a program whose number is the same as that of an existing program
0: An alarm is generated.
1: The existing program is deleted, then the new program is registered. Note that if the existing program is protected from being edited, it is not deleted, and an alarm is generated.

 # 5 N99 With an M99 block, when bit 6 (NPE) of parameter No.3201 = 0, program registration is assumed to be:
0: Completed

1: Not completed

 # 6 NPE With an M02, M30, or M99 block, program registration is assumed to be:
0: Completed
1: Not completed

	#7	#6	#5	#4	#3	#2	#1	#0
3202		PSR		NE9				NE8

[Input type] Parameter input
[Data type] Bit path

 # 0 NE8 Editing of subprograms with program numbers 8000 to 8999
0: Not inhibited
1: Inhibited
When this parameter is set to 1, the following editing operations are disabled:
(1) Program deletion (Even when deletion of all programs is specified, programs with program numbers 8000 to 8999 are not deleted.)
(2) Program output (Even when outputting all programs is specified, programs with program numbers 8000 to 8999 are not output.)
(3) Program number search
(4) Program editing of registered programs
(5) Program registration
(6) Program collation
(7) Displaying programs

 # 4 NE9 Editing of subprograms with program numbers 9000 to 9999
0: Not inhibited
1: Inhibited
When this parameter is set to 1, the following editing operations are disabled:
(1) Program deletion (Even when deletion of all programs is specified, programs with program numbers 9000 to 9999 are not deleted.)
(2) Program output (Even when outputting all programs is specified, programs with program numbers 9000 to 9999 are not output.)
(3) Program number search
(4) Program editing of registered programs
(5) Program registration
(6) Program collation
(7) Displaying programs

 # 6 PSR Search for the program number of a protected program
0: Disabled
1: Enabled

	#7	#6	#5	#4	#3	#2	#1	#0
3203	MCL	MER	MZE					

[Input type] Parameter input
[Data type] Bit path

 # 5 MZE After MDI operation is started, program editing during operation is:
0: Enabled
1: Disabled

 # 6 MER When the last block of a program has been executed at single block operation in the MDI mode, the executed block is:
0: Not deleted
1: Deleted

> **NOTE**
> When MER is set to 0, the program is deleted if the end-of-record mark (%) is read and executed. (The mark % is automatically inserted at the end of a program.)

 # 7 MCL Whether a program prepared in the MDI mode is cleared by reset
0: Not deleted
1: Deleted

	#7	#6	#5	#4	#3	#2	#1	#0
3204								PAR

[Input type] Parameter input
[Data type] Bit path

 # 0 PAR When a small MDI unit is used, characters "[" and "]" are:
0: Used as "[" and "]".
1: Used as "(" and ")".

> **NOTE**
> When a multi-path system is used, the setting for path 1 is followed.

	#7	#6	#5	#4	#3	#2	#1	#0
3205				OSC				

[Input type] Parameter input
[Data type] Bit

 # 4 OSC On the offset screen, offset value erasure by a soft key is:
0: Enabled.
1: Disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
3206							MIF	

[Input type] Parameter input

[Data type] Bit

 # 1 MIF Editing of the maintenance information screen is:
0: Not prohibited.
1: Prohibited.

	#7	#6	#5	#4	#3	#2	#1	#0
3208								SKY

[Input type] Parameter input
[Data type] Bit

 # 0 SKY The function key [SYSTEM] on the MDI panel is:
0: Enabled.
1: Disabled.

3210	Program protection (PSW)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 99999999

This parameter sets a password for protecting program Nos. 9000 to 9999. When a value other than zero is set in this parameter and this value differs from the keyword set in parameter No.3211, bit 4 (NE9) of parameter No.3202 for protecting program Nos. 9000 to 9999 is automatically set to 1.
This disables the editing of program Nos. 9000 to 9999. Until the value set as the password is set as a keyword, NE9 cannot be set to 0 and the password cannot be modified.

NOTE
1 The state where password ≠ 0 and password ≠ keyword is referred to as the locked state. When an attempt is made to modify the password by MDI input operation in this state, the warning message "WRITE PROTECTED" is displayed to indicate that the password cannot be modified. When an attempt is made to modify the password with G10 (programmable parameter input), alarm (PS0231) is issued.
2 When the value of the password is not 0, the parameter screen does not display the password. Care must be taken in setting a password.

3211	Program protection key (KEY)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 99999999

When the value set as the password (set in parameter No.3210) is set in this parameter, the locked state is released and the user can now modify the password and the value set in bit 4 (NE9) of parameter No.3202.

> **NOTE**
> The value set in this parameter is not displayed. When the power is turned off, this parameter is set to 0.

3220	Password (PSW)

[Input type] Locked parameter
[Data type] 2-word
[Valid data range] 0 to 99999999

This parameter sets a password (PSW). When a value other than 0 is set, a password is set. When a password is set, a blank is displayed in this parameter, and the state (locked state) where an operation such as program editing is locked is set. When password (PSW) = 0, namely, in the normal state, or when password (PSW) = keyword (KEY), namely, in the unlock state, this parameter can be set.

3221	Keyword (KEY)

[Input type] Locked parameter
[Data type] 2-word
[Valid data range] 0 to 99999999

When the same value as the password (PSW) is set in this parameter, the lock is released (unlock state). The value set in this parameter is not displayed.
The value of this parameter is initialized to 0 automatically when the power is turned on. So, if the power is turned off in the unlock state then is turned on again, the lock state is automatically set.

3222	Program protection range (minimum value) (PMIN)
3223	Program protection range (maximum value) (PMAX)

[Input type] Locked parameter
[Data type] 2-word
[Valid data range] 0 to 99999999

The programs in a range set here can be locked. Set the minimum program number and maximum program number of a desired range.
Set these parameters to satisfy PMAX > PMIN.
These parameters can be set when password (PSW) = 0, namely, in the normal state, or when password (PSW) = keyword (KEY), namely in the unlock state.
Example)
Parameter No.3222 = 7000
Parameter No.3223 = 8499

When the values above are set, the programs from O7000 to O8499 can be locked.
When PMIN = 0, the specification of PMIN = 9000 is assumed. When PMAX = 0, the specification of PMAX = 9999 is assumed. So, when these parameters are set to the defaults, the programs from O9000 to O9999 are locked.

NOTE

1 Parameter No. 3220 to No. 3223 are neither punched nor read.
2 Parameter No. 3220 to No. 3223 are not cleared even when a parameter file clear operation is performed in the IPL state.
3 The values of a password (PSW) and keyword (KEY) are not displayed. When password (PSW) = 0, 0 is displayed in parameter No. 3220 to indicate that the normal state is set.
4 When a password (PSW) or keyword (KEY) is set, [+INPUT] has the same effect as [INPUT]. For example, if the input operation "1[+INPUT]" is performed when 99 is set in the keyword (KEY) parameter, "1" is set.

	#7	#6	#5	#4	#3	#2	#1	#0
3233							PDM	

[Input type] Parameter input
[Data type] Bit

 # 1 PDM When the program directory screen displays a list of programs stored in the CNC file management format on the data server:
0: The data server mode is selected.
1: The CNC management format mode is selected.

3241	**Character blinking in the AI contour control I mode (first character)**
3242	**Character blinking in the AI contour control I mode (second character)**
3243	**Character blinking in the AI contour control I mode (third character)**
3244	**Character blinking in the AI contour control I mode (fourth character)**
3245	**Character blinking in the AI contour control I mode (fifth character)**
3246	**Character blinking in the AI contour control I mode (sixth character)**
3247	**Character blinking in the AI contour control I mode (seventh character)**

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 95

Set the first to seventh blinking characters in the AI contour control I mode by using ASCII codes represented as decimal numbers.
When 0 is set in all of these parameters, "AICC 1" blinks.
Code numbers 032 to 095 in the "character-code correspondence table" can be set.

3251	**Character blinking in the AI contour control II mode (first character)**
3252	**Character blinking in the AI contour control II mode (second character)**
3253	**Character blinking in the AI contour control II mode (third character)**
3254	**Character blinking in the AI contour control II mode (fourth character)**
3255	**Character blinking in the AI contour control II mode (fifth character)**
3256	**Character blinking in the AI contour control II mode (sixth character)**
3257	**Character blinking in the AI contour control II mode (seventh character)**

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 95

Set the first to seventh blinking characters in the AI contour control II mode by using ASCII codes represented as decimal numbers.
When 0 is set in all of these parameters, "AICC 2" blinks.
Code numbers 032 to 095 in the "character-code correspondence table" can be set.

	#7	#6	#5	#4	#3	#2	#1	#0
3280								NLC

[Input type] Parameter input
[Data type] Bit

 # 0 NLC Dynamic display language switching is:
0: Enabled.
1: Disabled.
When dynamic display language switching is disabled, the language setting screen is not displayed. In this case, change the setting of parameter No. 3281 on the parameter screen then turn on the power again to switch the display language.

3281	Display language

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 14
Select a display language from the following:
0 : English
1 : Japanese
2 : German
3 : French
4 : Chinese
5 : Italian
6 : Korean
7 : Spanish
8 : Dutch
9 : Danish
10 : Portuguese
11 : Polish
12 : Hungarian
13 : Swedish
14 : Czech
If a number not indicated above is set, English is selected.

	#7	#6	#5	#4	#3	#2	#1	#0
3290	KEY		GO2	IWZ	WZO		GOF	WOF
	KEY			IWZ	WZO		GOF	WOF

[Input type] Parameter input
[Data type] Bit path

 # 0 WOF Setting the tool offset value (tool wear offset) by MDI key input is:
0: Not disabled
1: Disabled (With parameter No.3294 and No.3295, set the offset number range in which updating the setting is to be disabled.)

> **NOTE**
> When tool offset memory A is selected with the M series, the tool offset set in the parameter WOF is followed even if geometric compensation and wear compensation are not specified with the T series.

 # 1 GOF Setting the tool geometry offset value by MDI key input is:
0: Not disabled
1: Disabled (With parameter No.3294 and No.3295, set the offset number range in which updating the setting is to be disabled.)

 # 3 WZO Setting a workpiece zero point offset value and workpiece shift value (T series) by MDI key input is:
0: Not disabled
1: Disabled

 # 4 IWZ Setting a workpiece zero point offset value or workpiece shift value (T series) by MDI key input in the automatic operation activation or halt state is:
0: Not disabled
1: Disabled

 # 5 GO2 Setting the second geometric tool offset value by MDI key input is:
0: Disabled.
1: Not disabled.

 # 7 KEY For memory protection keys:
0: The KEY1, KEY2, KEY3, and KEY4 signals are used.
1: Only the KEY1 signal is used.

> **NOTE**
> 1 The functions of the signals depend on whether KEY=0 or KEY=1.
> When KEY = 0:
> - KEY1: Enables a tool offset value, workpiece zero point offset value, and workpiece shift value to be input.
> - KEY2: Enables setting data, macro variables, and tool life management value to be input.
> - KEY3: Enables program registration and editing.
> - KEY4: Enables PMC data (counter and data table) to be input.
>
> When KEY = 1:
> - KEY1: Enables program registration and editing, and enables PMC parameter input.
> - KEY2 to KEY4: Not used
>
> 2 When a multi-path system is used, the setting for path 1 is followed.

	#7	#6	#5	#4	#3	#2	#1	#0

3291								WPT

[Input type] Parameter input
[Data type] Bit path

 # 0 WPT The input of the tool wear compensation amount is:
0: Enabled according to memory protection key signal KEY1.
1: Enabled, regardless of the memory protection key signal KEY1.

3294	Start number of tool offset values whose input by MDI is disabled

3295	Number of tool offset values (from the start number) whose input by MDI is disabled

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 999

When the modification of tool offset values by MDI key input is to be disabled using bit 0 (WOF) of parameter No.3290 and bit 1 (GOF) of parameter No.3290, parameter Nos. 3294 and 3295 are used to set the range where such modification is disabled. In parameter No.3294, set the offset number of the start of tool offset values whose modification is disabled. In parameter No.3295, set the number of such values. In the following cases, however, none of the tool offset values may be modified:

- When 0 or a negative value is set in parameter No. 3294
- When 0 or a negative value is set in parameter No. 3295
- When a value greater than the maximum tool offset number is set in parameter No. 3294

In the following case, a modification to the values ranging from the value set in parameter No. 3294 to the maximum tool offset number is disabled:
When the value of parameter No. 3294 added to the value of parameter No. 3295 exceeds the maximum tool offset number
When the offset value of a prohibited number is input through the MDI panel, the warning "WRITE PROTECT" is issued.
[Example]
When the following parameter settings are made, modifications to both of the tool geometry offset values and tool wear offset values corresponding to offset numbers 51 to 60 are disabled:

- Bit 1 (GOF) of parameter No. 3290 = 1 (to disable tool geometry offset value modification)
- Bit 0 (WOF) of parameter No. 3290 = 1 (to disable tool wear offset value modification)
- Parameter No. 3294 = 51
- Parameter No. 3295 = 10

If the setting of bit 0 (WOF) of parameter No. 3290 is set to 0 without modifying the other parameter settings above, tool geometry offset value modification only is disabled, and tool wear offset value modification is enabled.

3321	Screen number assigned to the 1st vertical soft key

:

3336	Screen number assigned to the 16th vertical soft key

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 10000

Assign a screen number to be displayed as a shortcut to a vertical soft key.

The 1st to 8th vertical soft keys are displayed on page 1, and the 9th to 16th vertical soft keys are displayed on page 2.
When specifying page 2, be sure to specify "Display of next page" on each page.
When not specifying page 2, set 0 for the 9th to 16th soft keys. In this case, page 2 is not used, so that "Display of next page" need not be specified on page 1.

(1) CNC operation screens

Screen No.	Screen name	Screen No.	Screen name
99	Display of next page(*1)	143	Spindle setting
100	Absolute position display(*2)	144	Spindle adjustment
101	Relative position display(*2)	145	Spindle monitor
102	Overall position display(*2)	146	FSSB amplifier setting
103	Overall position display(*3)	147	FSSB axis setting
104	Handle screen	148	FSSB amplifier maintenance
105	Monitor screen	149	Servo setting
106	Manual feed for 5-axis machining	150	Servo adjustment
107	Program	151	Periodic maintenance State
108	Program directory display	152	Periodic maintenance Machine
109	Next block	153	Periodic maintenance NC
110	Program check	154	8-level data protection Operation level setting
111	Time display	155	8-level data protection Password change
112	Manual value specification	156	8-level data protection Protection level setting
113	Program restart	157	Protection against wrong operations
114	Offset display	158	Protection against wrong operations Offset range setting screen
115	Setting parameter	159	Protection against wrong operations External workpiece origin offset range setting screen
116	Coordinate system display	160	Protection against wrong operations Workpiece origin offset range setting screen
117	Software operator's panel	161	Protection against wrong operations Y-axis offset range setting screen
118	Y-axis offset	162	Protection against wrong operations Workpiece shift range setting screen
119	Workpiece coordinate system shift	163	Servo guide Y-TIME
120	Second geometry offset	164	Servo guide XY
121	Tool geometry data	165	Servo guide CIRCLE
122	Precision level	166	Servo guide FOURIER
123	Chopping	167	Servo guide BODE
124	Chuck/tail	168	Servo guide Channel setting
125	Language	169	Alarm Details
126	Parameter	170	Alarm All paths
127	Diagnosis	171	Waveform diagnosis Graph
128	System configuration	172	Waveform diagnosis Parameter
129	Memory contents display	173	Operation history
130	Pitch error compensation	174	Operation history signal selection
131	Machining adjustment	175	Cartridge management
132	Color setting	176	Tool management
133	Maintenance information	177	Power Mate CNC manager Absolute coordinates
134	Touch panel calibration(*2)	178	Power Mate CNC manager Machine coordinates
135	Parameter adjustment	179	Power Mate CNC manager Parameter
136	M code group	180	Power Mate CNC manager Message
137	Three-dimensional error compensation	181	Power Mate CNC manager Diagnosis
138	External operator message	182	Power Mate CNC manager System configuration
139	Alarm history	183	Macro Custom
140	External operator message history	184	Macro Execution
141	Drawing parameter	185	Macro Conversation
142	Tool path drawing	186	Macro Auxiliary

*1 Definition for feeding vertical soft key pages
*2 Specifiable with a 10.4-inch display unit only
*3 Specifiable with a 15-inch display unit only

(2) PMC operation screens

Screen No.	Screen name
200	PMC signal status
201	PMC IO link
202	PMC alarm
203	PMC input/output
204	PMC timer
205	PMC counter
206	PMC keep relay
207	PMC data table
208	PMC trace
209	PMC trace setting
210	PMC program directory display
211	PMC ladder diagram display
212	PMC title setting
213	PMC configuration parameter setting
214	PMC general setting
215	PMC status
216	PMC system parameter
217	PMC IO assignment
218	PMC symbol
219	PMC message
220	PMC online setting

(3) Communication operation screens

Screen No.	Screen name
Ethernet setting	
300	[Built-in port] Common
301	[Built-in port] FOCAS2/Ethernet
302	[Built-in port] FTP transfer
303	[Built-in port] PING
304	[Built-in port] Communication state
305	[Built-in port] Task state
306	[PCMCIA] Common
307	[PCMCIA] FOCAS2/Ethernet
308	[PCMCIA] FTP transfer
309	[PCMCIA] PING
310	[PCMCIA] Communication state
311	[PCMCIA] Task state
312	[Board] Common
313	[Board] FOCAS2/Ethernet
314	[Board] Data server
315	[Board] PING
316	[Board] Communication state
317	[Board] Task state
318	[Board] DS mode
319	[Board] DS format
Ethernet log	
320	[Built-in/PCMCIA] Overall
321	[Built-in/PCMCIA] Common
322	[Built-in/PCMCIA] FOCAS2/Ethernet
323	[Built-in/PCMCIA] FTP transfer
Profibus setting	
324	[MASTER] Overall
325	[MASTER] Bus parameter
326	[MASTER] Streb table
327	[MASTER] Communication state
328	[MASTER] Slave parameter
329	[MASTER] Module data
330	[MASTER] DI/DO address
331	[MASTER] Mode

4.17 PARAMETERS OF PROGRAMS

	#7	#6	#5	#4	#3	#2	#1	#0
3400		SMX	PGD				MGC	MGO

[Input type] Parameter input
[Data type] Bit path

 # 0 MGO If the program restart M/S/T/B code output function is used:
0: When bit 6 (MOA) of parameter No. 7300 is set to 0, the last M code only is output. When bit 6 (MOA) of parameter No. 7300 is set to 1, M codes are output in a specified order.
1: When bit 6 (MOA) of parameter No. 7300 is set to 0, the last M code of each M code group is output. When bit 6 (MOA) of parameter No. 7300 is set to 1, M codes are output in the order of groups.

NOTE
This parameter is valid only when the optional M code grouping function is used and bit 7 (MOU) of parameter No. 7300 is set to 1.

 # 1 MGC When a single block specifies multiple M commands, an M code group check is:
0: Made.
1: Not made.

 # 5 PGD The G10.9 command (programmable diameter/radius specification switching) is:
0: Disabled.
1: Enabled.

NOTE
1 The option for the dynamic diameter/radius switching function is required.
2 When the G10.9 command is enabled by this parameter, signal-based dynamic diameter/radius switching is disabled.

 # 6 SMX An S code specified in a block that specifies G92 (G50 with G code system A of the T series) is:
0: Regarded as a maximum spindle speed command.
1: Not regarded as a maximum spindle speed command (but regarded as a spindle speed command).

	#7	#6	#5	#4	#3	#2	#1	#0
3401	GSC	GSB						DPI
								DPI

[Input type] Parameter input
[Data type] Bit path

 # 0 DPI When a decimal point is omitted in an address that can include a decimal point
0: The least input increment is assumed. (Normal decimal point input)
1: The unit of mm, inches, degree, or second is assumed. (Pocket calculator type decimal point input)

 # 6 GSB The G code system is set.
 # 7 GSC

GSC	GSB	G code
0	0	G code system A
0	1	G code system B
1	0	G code system C

NOTE
G code system B and G code system C are optional functions. When no option is selected, G code system A is used, regardless of the setting of these parameters.

	#7	#6	#5	#4	#3	#2	#1	#0
3402	G23	CLR		FPM	G91			G01
	G23	CLR	G70		G91	G19	G18	G01

[Input type] Parameter input
[Data type] Bit path

 # 0 G01 G01 Mode entered when the power is turned on or when the control is cleared
0: G00 mode (positioning)
1: G01 mode (linear interpolation)

 # 1 G18 Plane selected when power is turned on or when the control is cleared
0: G17 mode (plane XY)
1: G18 mode (plane ZX)

 # 2 G19 Plane selected when power is turned on or when the control is cleared
0: The setting of bit 1 (G18) of parameter No. 3402 is followed.
1: G19 mode (plane YZ)
When this bit is set to 1, set bit 1 (G18) of parameter No. 3402 to 0.

 # 3 G91 When the power is turned on or when the control is cleared
0: G90 mode (absolute command)
1: G91 mode (incremental command)

 # 4 FPM At power-on time or in the cleared state:
0: G99 or G95 mode (feed per revolution) is set.
1: G98 or G94 mode (feed per minute) is set.

 # 5 G70 The commands for inch input and metric input are:
0: G20 (inch input) and G21 (metric input).
1: G70 (inch input) and G71 (metric input).

 # 6 CLR Reset button on the MDI panel, external reset signal, reset and rewind signal, and emergency stop signal
0: Cause reset state.
1: Cause clear state.
For the reset and clear states, refer to Appendix in the User's Manual.

 # 7 G23 When the power is turned on
0: G22 mode (stored stroke check on)
1: G23 mode (stored stroke check off)

	#7	#6	#5	#4	#3	#2	#1	#0
3403			CIR					

[Input type] Parameter input
[Data type] Bit path

 # 5 CIR When neither the distance (I, J, K) from a start point to the center nor an arc radius (R) is specified in circular interpolation (G02, G03) or helical interpolation (G02, G03):
0: The tool moves to an end point by linear interpolation.
1: An alarm PS0022 is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
3404	M3B		M02	M30		SBP		

[Input type] Parameter input
[Data type] Bit path

 # 2 SBP In an external device subprogram call, the address P format is based on:
0: File number specification
1: Program number specification

NOTE
In memory card operation, the program number specification format is used, regardless of the setting of this parameter.

 # 4 **M30** When M30 is specified in a memory operation:

0: M30 is sent to the machine, and the head of the program is automatically searched for. So, when the ready signal FIN is returned and a reset or reset and rewind operation is not performed, the program is executed, starting from the beginning.

1: M30 is sent to the machine, but the head of the program is not searched for. (The head of the program is searched for by the reset and rewind signal.)

 # 5 **M02** When M02 is specified in memory operation

0: M02 is sent to the machine, and the head of the program is automatically searched for. So, when the end signal FIN is returned and a reset or reset and rewind operation is not performed, the program is executed, starting from the beginning.

1: M02 is sent to the machine, but the head of the program is not searched for. (The head of the program is searched for by the reset and rewind signal.)

 # 7 **M3B** The number of M codes that can be specified in one block

0: One

1: Up to three

	#7	#6	#5	#4	#3	#2	#1	#0
3405			DDP	CCR	G36		DWL	AUX
							DWL	AUX

[Input type] Parameter input
[Data type] Bit path

 # 0 AUX When the second auxiliary function is specified in the calculator-type decimal point input format or with a decimal point, the multiplication factor for a value output (onto the code signal) relative to a specified value is such that:
0: The same multiplication factor is used for both of metric input and inch input.
1: A multiplication factor used for inch input is 10 times greater than that used for metric input.

When the second auxiliary function is specified in the calculator-type decimal point input format or with a decimal point, the value output onto the code signal is a specified value multiplied by a value indicated below.

Increment system		Parameter AUX=0	Parameter AUX=1
Metric input system	IS-A for reference axis	100 times	100 times
	IS-B for reference axis	1000 times	1000 times
	IS-C for reference axis	10000 times	10000 times
	IS-D for reference axis	100000 times	100000 times
	IS-E for reference axis	1000000 times	1000000 times
Inch input system	IS-A for reference axis	100 times	1000 times
	IS-B for reference axis	1000 times	10000 times
	IS-C for reference axis	10000 times	100000 times
	IS-D for reference axis	100000 times	1000000 times
	IS-E for reference axis	1000000 times	10000000 times

 # 1 DWL The dwell time (G04) is:
0: Always dwell per second.
1: Dwell per second in the feed per minute mode (G94), or dwell per rotation in the feed per rotation mode (G95).

 # 3 G36 As a G code to be used with the automatic tool length measurement function (M series)/automatic tool offset function (T series) is:
0: G36 (T series only)/G37 is used.
1: G37.1/G37.2/G37.3 is used.

NOTE
If it is necessary to perform circular threading (counterclockwise), set this parameter to 1.

 # 4 CCR Addresses used for chamfering

0: Address is “I”, “J”, or “K”.
In direct drawing dimension programming, addresses ",C", ",R", and ",A" (with comma) are used in stead of "C", "R", and "A".

1: Address is “C”.
Addresses used for direct drawing dimension programming are "C", "R", and "A" without comma.

> **NOTE**
> If this bit (CCR) is set to 0, the function for changing the compensation direction by specifying I, J, or K in a G01 block in the cutter compensation/ tool nose radius compensation mode cannot be used.
> If this bit (CCR) is set to 1 when address C is used as an axis name, the chamfer function cannot be used.

 # 5 DDP Angle commands by direct drawing dimension programming

0: Normal specification

1: A supplementary angle is given.

	#7	#6	#5	#4	#3	#2	#1	#0
3406	C07	C06	C05	C04	C03	C02	C01	

	#7	#6	#5	#4	#3	#2	#1	#0
3407	C15	C14	C13	C12	C11	C10	C09	C08

	#7	#6	#5	#4	#3	#2	#1	#0
3408	C23	C22	C21	C20	C19	C18	C17	C16

	#7	#6	#5	#4	#3	#2	#1	#0
3409	CFH	C30	C29	C28	C27	C26	C25	C24

[Input type] Parameter input
[Data type] Bit

C01 to C30 If bit 6 (CLR) of parameter No. 3402 is set to 1, set a group of G codes to be placed in the cleared state when the CNC is reset by the reset key of the MDI panel, the external reset signal, the reset & rewind signal, or the emergency stop signal.
The table below indicates the correspondence between bits and G code groups
The setting of a bit has the following meaning:

0: Places the G code group in the cleared state.

1: Does not place G code group in the cleared state.

Parameter	G code group
C01	01
C02	02
C03	03
:	:
D30	30

 # 7 CFH When parameter CLR (No.3402#6) is 1, the reset button on the MDI panel, the external reset signal, the reset and rewind signal, or emergency stop will,

0: Clear F codes, H codes (for the M series), D codes (for the M series), and T codes (for the T series).

1: Not clear F codes, H codes (for the M series), D codes (for the M series), and T codes (for the T series).

3410	Tolerance of arc radius

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to 999999999

When a circular interpolation command is executed, the tolerance for the radius between the start point and the end point is set.

3411	M code preventing buffering 1

3412	M code preventing buffering 2

:

3420	M code preventing buffering 10

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 999999999

Set M codes that prevent buffering the following blocks. If processing directed by an M code must be performed by the machine without buffering the following block, specify the M code.

M00, M01, M02, and M30 always prevent buffering even when they are not specified in these parameters.

3421	**Range specification 1 of M codes that do not perform buffering (lower limit)**
3422	**Range specification 1 of M codes that do not perform buffering (upper limit)**
3423	**Range specification 2 of M codes that do not perform buffering (lower limit)**
3424	**Range specification 2 of M codes that do not perform buffering (upper limit)**
3425	**Range specification 3 of M codes that do not perform buffering (lower limit)**
3426	**Range specification 3 of M codes that do not perform buffering (upper limit)**
3427	**Range specification 4 of M codes that do not perform buffering (lower limit)**
3428	**Range specification 4 of M codes that do not perform buffering (upper limit)**
3429	**Range specification 5 of M codes that do not perform buffering (lower limit)**
3430	**Range specification 5 of M codes that do not perform buffering (upper limit)**
3431	**Range specification 6 of M codes that do not perform buffering (lower limit)**
3432	**Range specification 6 of M codes that do not perform buffering (upper limit)**

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999

When a specified M code is within the range specified with parameter Nos. 3421 and 3422, 3423 and 3424, 3425 and 3426, 3427 and 3428, 3429 and 3430, or 3431 and 3432, buffering for the next block is not performed until the execution of the block is completed.

NOTE

M00, M01, M02, and M30 are M codes that do not perform buffering, regardless of parameter setting. M98, M99, M codes for calling subprograms, and M codes for calling custom macros are M codes that performs buffering, regardless of parameter setting.

3436	**Range specification 1 of second auxiliary function codes that do not perform buffering (lower limit)**
3437	**Range specification 1 of second auxiliary function codes that do not perform buffering (upper limit)**
3438	**Range specification 2 of second auxiliary function codes that do not perform buffering (lower limit)**
3439	**Range specification 2 of second auxiliary function codes that do not perform buffering (upper limit)**

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 99999999

Set the upper limit and lower limit of a series of second auxiliary function codes that do not perform buffering.
These parameters are invalid if the setting of an upper limit conflicts with the setting of a lower limit.

3441	**Start number of M codes for which an M code group can be set (1)**
3442	**Start number of M codes for which an M code group can be set (2)**
3443	**Start number of M codes for which an M code group can be set (3)**
3444	**Start number of M codes for which an M code group can be set (4)**

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0, 100to99999999

Code numbers 0 to 99 on the M code group setting screen correspond to M00 to M99. When adding M codes after the first 100 M codes, specify a start M code number in these parameters. Thus, up to 400 M codes can be added to the M code group setting screen in groups of 100 M codes starting with the set value. When 0 is set, no M codes are added to the M code group setting screen.
When setting these parameters, follow the setting condition described below. If the condition is not satisfied, no M codes are added to the M code group setting screen as in the case where 0 is set.
(Setting condition)

The settings of parameters (1) to (4) (excluding the setting of 0) must satisfy:
99 < (1), (1)+99 < (2), (2)+99 < (39, (3) +99 < (4)

	#7	#6	#5	#4	#3	#2	#1	#0
3450	BDX							AUP

[Input type] Parameter input
[Data type] Bit path

 # 0 AUP The second auxiliary function specified in the calculator-type decimal point input format, with a decimal point, or with a negative value is:
0: Disabled.
1: Enabled.
If the second auxiliary function is specified after setting this bit to 0, the following operation results:
1. When a value is specified without a decimal point
   A specified value is output onto the code signal without modification, regardless of the setting of the calculator-type decimal point input format (with bit 0 (DPI) of parameter No. 3401).
2. When a value is specified with a decimal point
   The alarm (PS0007) is issued.
3. When a negative value is specified
   The alarm (PS0006) is issued.

 # 7 BDX When ASCII code is called using the same address as the address for the second auxiliary function (specified by parameter No. 3460), this parameter prevents the argument unit used when the option for the second auxiliary function is selected from differing from the argument unit used when the same option is not selected.
0: When bit 0 (AUP) of parameter No. 3450 is set to 1, the argument unit differs, depending on whether the option for the second auxiliary function is selected or not.
1: The same argument unit is used. (The unit applied when the option for the second auxiliary function is selected is used.)
[Example]
A setting is made so that address B is used to call O9004, and the program O1 below is executed with parameter No. 3460 = 66.

```
O1      O9004
B2      #500 = #146
M30           M99
```

When the increment system is IS-B, and metric input is used, #500 assumes a value indicated in the table below.

Bit 0 (DPI) of parameter No. 3401	Bit 0 (AUP) of parameter No. 3450	BDX=0		BDX=1
		Without the second auxiliary function option	With the second auxiliary function option	
0	0	2.000	2.000	2.000
	1	2.000	0.002	0.002
1	0	2.000	2.000	2.000
	1	2.000	2.000	2.000

	#7	#6	#5	#4	#3	#2	#1	#0

3451								
								GQS

[Input type] Parameter input
[Data type] Bit path

 # 0 GQS When threading is specified, the threading start angle shift function (Q) is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
3452	EAP							

[Input type] Parameter input
[Data type] Bit path

 # 7 EAP When bit 0 (ADX) of parameter No. 3455 is set to 1, calculator-type decimal point input at a macro calling argument address is:
0: Enabled.
1: Disabled.

> **NOTE**
> This parameter is valid when bit 0 (DPI) of parameter No. 3401 is set to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
3453								CRD

[Input type] Setting input
[Data type] Bit path

 # 0 CRD If the functions of chamfering or corner R and direct drawing dimension programming are both enabled,
0: Chamfering or corner R is enabled.
1: Direct drawing dimension programming is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
3455								AXDx

[Input type] Parameter input
[Data type] Bit axis

 # 0 AXDx If a decimal point is omitted for an axis address with which a decimal point can be used, the value is determined:
0: In accordance with the least input increment. (Normal decimal point input)
1: In millimeters, inches, or seconds. (calculator-type decimal point input)

> **NOTE**
> This parameter specifies the calculator-type decimal point input function for each axis.
> For the same axis name, be sure to make the same setting.

	#7	#6	#5	#4	#3	#2	#1	#0
3457	SCF				SYS	MC1	MC2	LIB

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> 1 The parameters LIB, MC2, MC1, and SYS are used to set a search folder for the following subprogram/macro calls:
> ・Subprogram call based on an M code
> ・Subprogram call based on a particular address
> ・Subprogram call based on a second auxiliary function code
> ・Macro call based on a G code
> ・Macro call based on an M code
> ・Macro call based on a T code
> ・One-touch macro call
>
> 2 The parameter SCF is used to set whether to add a search folder for the following subprogram/macro calls:
> ・Subprogram call based on M98
> ・Figure copy based on G72.1/G72.2
> ・Macro call based on G65/G66/G66.1
> ・Macro interrupt based on M96

 # 0 LIB The common program directory "//CNC_MEM/USER/LIBRARY/" of the initial directories is:
0: Set as a search directory.

1: Not set as a search directory.

 # 1 MC2 MTB dedicated directory 2 "//CNC_MEM/MTB2/" of the initial directories is:
0: Set as a search directory.
1: Not set as a search directory.

 # 2 MC1 MTB dedicated directory 1 "//CNC_MEM/MTB1/" of the initial directories is:
0: Set as a search directory.
1: Not set as a search directory.

 # 3 SYS The system directory "//CNC_MEM/SYSTEM/" of the initial directories is:
0: Set as a search directory.
1: Not set as a search directory.

 # 7 SCF A search folder is:
0: Not added.
1: Added.

When a search folder is added, a search is made in the following order:
1) Folder where the main program is stored
2) Common program folder, which is an initial folder
3) MTB-dedicated folder 2, which is an initial folder
4) MTB-dedicated folder 1, which is an initial folder
5) System folder, which is an initial folder

The folders of 3) through 5) can be excluded from search target folders by setting the parameters MC2, MC1, and SYS.

3460	Second auxiliary function specification address

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 65to67, 85to87

Specify which of A, B, C, U, V, and W is to be used as the address for specifying the second auxiliary function. If an address used as an axis name is specified, the second auxiliary function is disabled.

Name	A	B	C	U	V	W
Setting value	65	66	67	85	86	87

Address B is assumed when a value other than the above is set.
However, the name U, V, or W can be used with the T series only when G code system B or C is used. When a value from 85 to 87 is specified with G code system A, the specification address for the second auxiliary function is B.

3471	Allowable difference between the specified end position and the end position obtained from the increase/decrease and frequency in spiral

	interpolation or conic interpolation

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 to 999999999

This parameter sets the maximum allowable difference (absolute value) between the specified end position and the end position obtained from the increase/decrease and frequency in spiral or conic interpolation.

3472	**Minimum radius needed to maintain the actual speed in spiral or conic interpolation**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] (For IS-B and millimeter machines, 1.0 to 999999.999; for inch machines, 1.0 to 99999.9999)

If this parameter value is 0 or a value outside the valid data range, the minimum value of the range is assumed.

In spiral interpolation and conic interpolation, the speed is generally held constant. In an area near the center, the spiral radius decreases, resulting in an extremely high angular velocity. To prevent this, once the spiral radius has reached the parameter-set value, the angular velocity subsequently remains constant. As a result, the actual speed decreases.

4.18 PARAMETERS OF PITCH ERROR COMPENSATION

	#7	#6	#5	#4	#3	#2	#1	#0
3601							EPC	

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 1 EPC The pitch error compensation on an axis of Cs contour control on the slave spindle side during simple synchronous spindle control is:
0: The same as that on the master spindle.
1: Just for the slave spindle.

	#7	#6	#5	#4	#3	#2	#1	#0
3605							IPPx	BDPx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 BDPx Both-direction pitch error compensation is:
0: Not used.
1: Used.

 # 1 IPPx Interpolation type pitch error compensation is:
0: Not used.
1: Used.
In interpolation type pitch error compensation, a compensation value at each point in each error completion point interval is divided for output of one pulse at equally spaced intervals.
If cycle type second pitch error compensation and interpolation type pitch error compensation are used at the same time, a cycle type second pitch error compensation value is output in interpolation mode within a cycle type second pitch error compensation point interval.
If a high feedrate is used, multiple compensation pulse may be output at a time.
A minimum interval where multiple compensation pulses are not output at a time is determined by the following expression:
Minimum pitch error compensation point interval = (Fmax/7500) × (Pmax+1)
Fmax: Maximum feedrate
Pmax: Maximum pitch error compensation value
Example:

When the maximum feedrate is 15000 mm/min, and the maximum pitch error compensation value is 7 pulses, the minimum compensation point interval is 16mm.

> **NOTE**
> Interpolation type pitch error compensation cannot be used with spindle positioning.

3620	Number of the pitch error compensation position for the reference position for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1023

Set the number of the pitch error compensation position for the reference position for each axis.

3621	Number of the pitch error compensation position at extremely negative position for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1023

Set the number of the pitch error compensation position at the extremely negative position for each axis.

3622	Number of the pitch error compensation position at extremely positive position for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1023

Set the number of the pitch error compensation position at the extremely positive position for each axis.
This value must be larger than set value of parameter (No.3620).

3623	Magnification for pitch error compensation for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to 100

Set the magnification for pitch error compensation for each axis.
If the magnification is set to 1, the same unit as the detection unit is used for the compensation data.

3624	Interval between pitch error compensation positions for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] See the description below.

The pitch error compensation positions are arranged with equal spacing. The space between two adjacent positions is set for each axis.
The minimum interval between pitch error compensation positions is limited and obtained from the following equation:
Minimum interval between pitch error compensation positions = maximum feedrate/7500
Unit : mm, inch, deg or mm/min, inch/min, deg/min
Example:

When the maximum feedrate is 15000 mm/min, the minimum interval between pitch error compensation positions is 2 mm.

3625	Travel distance per revolution in pitch error compensation of rotation axis type

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] See the description below.

If the pitch error compensation of rotation axis type is performed (bit 1 (ROSx) of parameter No. 1006 is set to 0 and bit 0 (ROTx) of parameter No. 1006 is set to 1), set the travel distance per revolution. The travel distance per revolution does not have to be 360 degrees, and a cycle of pitch error compensation of rotation axis type can be set.
However, the travel distance per revolution, compensation interval, and number of compensation points must satisfy the following condition:
(Travel distance per revolution) = (Compensation interval) × (Number of compensation points)
The compensation at each compensation point must be set so that the total compensation per revolution equals 0.

NOTE
If 0 is set, the travel distance per revolution becomes 360 degrees.

3626	Number of the both-direction pitch error compensation position at extremely negative position (for movement in the negative direction)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1023, 3000 to 4023

When using both-direction pitch error compensation, set the number of compensation point at the farthest end in the negative direction for a movement in the negative direction.

> **NOTE**
> 1 For a movement in the positive direction, set the compensation point number at the farthest end in the negative direction in parameter No. 3621.
> 2 A set of compensation data items for a single axis should not be set to lie astride 1023 to 3000.

3627	Pitch error compensation at reference position when a movement to the reference position is made from the direction opposite to the direction of reference position return

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -32768 to 32767

Set the absolute value of pitch error compensation at reference position when a movement to the reference position is made from the negative direction if the direction of reference position return (bit 5 (ZMI) of parameter No. 1006) is positive or from the positive direction if the direction of reference position return is negative.

3661	Number of a pitch error compensation position for the reference position for each slave axis when independent pitch error compensation is performed under simple spindle synchronous control

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 1023

Set the number of a pitch error compensation position for the reference position.

> **NOTE**
> 1 This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).
> 2 The usable number of pitch error compensation positions and their range depend on the option configuration.

3666	Number of the pitch error compensation position at extremely negative position for each slave axis when independent pitch error compensation is performed under simple spindle synchronous control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 1023

Set the compensation position number at the farthest end in the negative direction.

NOTE
1. This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).
2. When using the both-direction pitch error compensation function, set a compensation position number for a movement in the positive direction.
3. The usable number of pitch error compensation positions and their range depend on the option configuration.

3671	Number of the pitch error compensation position at extremely positive position for each slave axis when independent pitch error compensation is performed under simple spindle synchronous control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 1023

Set the compensation position number at the farthest end in the positive direction.

NOTE
1 This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).
2 When using the both-direction pitch error compensation function, set a compensation position number for a movement in the positive direction.
3 The usable number of pitch error compensation positions and their range depend on the option configuration.

3676	Number of the pitch error compensation position at extremely negative position for each slave axis when independent both-direction pitch error compensation is performed under simple spindle synchronous control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 1023

When using both-direction pitch error compensation, set the compensation position number at the farthest end in the negative direction for a movement in the negative direction.

NOTE
1 This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).
2 The usable number of pitch error compensation positions and their range depend on the option configuration.

3681	Pitch error compensation value at the reference position when a movement is made to the reference position in the direction opposite to the reference position return direction for each slave axis in the case where independent both-direction pitch error compensation is performed under simple spindle synchronous control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] -32767 to 32767

By using an absolute value, set a pitch error compensation value at the reference position when a movement is made in the negative direction if the reference position return direction (bit 5 (ZMI) of parameter No. 1006) is positive or when a movement is made in the positive direction if the reference position return direction (bit 5 (ZMI) of parameter No. 1006) is negative.

NOTE
This parameter is valid if pitch error compensation on an axis of Cs contour control on the salve side during simple synchronous spindle control is carried out just for the slave axis (bit 1 (EPC) of parameter No. 3601 is set to 1).

4.19 PARAMETERS OF SPINDLE CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
3700							NRF	CRF

[Input type] Parameter input
[Data type] Bit path

 # 0 CRF Reference position setting at an arbitrary position under Cs contour control is:
0: Not used.
1: Used.

NOTE
When this function is used, an attempt to specify G00 for a Cs contour control axis without performing a reference position return operation even once after switching the serial spindle to the Cs contour control mode results in the alarm (PS0303) even if bit 1 (NRF) of parameter No. 3700 is set to 0. Be sure to perform a reference position return operation by specifying G28.

 # 1 NRF With the first move command (G00) after switching the series spindle to Cs contour control mode:
0: A reference position return operation is once performed then positioning is performed.
1: A normal positioning operation is performed.

	#7	#6	#5	#4	#3	#2	#1	#0
3702							EMS	

[Input type] Parameter input
[Data type] Bit path

 # 1 EMS The multi-spindle control function is:
0: Used.
1: Not used.

	#7	#6	#5	#4	#3	#2	#1	#0
3703					MPP	MPM		2P2

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 2P2 When a multi-path system is used, inter-path spindle control allows:

0: Configuration where the spindle that belongs to one path only is shared between path 1 and path 2.
1: Configuration where the spindles that belong to path 1 and 2 are shared between the two paths.

When the spindle that belongs to an arbitrary path is shared between arbitrary paths, set bit 2 (MPM) of parameter No. 3703. (The meanings of signals used vary, so that ladder program modifications need to be made.)

 # 2 MPM When a multi-path system is used, the configuration allowed by inter-path spindle control:

0: Follows the setting of bit 0 (2P2) of parameter No. 3703.
1: Allows the sharing of the spindle that belongs to a path between arbitrary paths.

 # 3 MPP In multi-spindle control, a spindle selection using a programmed command instead of using the signals (SWS1 to SWS4<G027#0 to #2,G026#3>) is:

0: Not made.
1: Made.

> **NOTE**
> When this parameter is set to 1, set parameter No. 3781 at the same time.

		#7	#6	#5	#4	#3	#2	#1	#0
3704		CSS		SSY	SSS				

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 4 SSS Synchronous spindle control by each spindle is:
0: Not performed.
1: Performed.
The master axis and slave axis of synchronous spindle control can be selected from the arbitrary spindles.
The target spindle of synchronous spindle control is specified in parameter No. 4831.
In addition, the following signals affect the control.
In addition, the following signals affect the control.
- Synchronous spindle signals of each spindle SPSYCs
- Signals of synchronous control of the spindle phase for each spindle SPPHSs

 # 5 SSY Simple synchronous spindle control by each spindle is:
0: Not performed.
1: Performed.
The master axis and slave axis of simple synchronous spindle control can be selected from the arbitrary spindles.
The target spindle of simple synchronous spindle control is set in parameter No. 4821.
In addition, the following signals affect the control.
- Signals of simple synchronous control of each spindle ESSYCs
- Parking signals of simple synchronous control of each spindle PKESEs

 # 7 CSS On the each spindle, Cs contour control is:
0: Not performed.
1: Performed.

	#7	#6	#5	#4	#3	#2	#1	#0
3705		SFA		EVS	SGT	SGB		ESF
		SFA	NSF		SGT	SGB	GST	ESF

[Input type] Parameter input
[Data type] Bit path

 # 0 ESF When the spindle control function (Spindle analog output or Spindle serial output) is used, and the constant surface speed control function is used or bit 4 (GTT) of parameter No.3705 is set to 1:

0: S codes and SF are output for all S commands.

1: For the T series:
S codes and SF are not output for an S command in the constant surface speed control (G96) mode and a command for maximum spindle speed clamping (G92S-- - ; (G50 for G code system A)).
For the M series:
S codes and SF are not output for an S command in the constant surface speed control (G96) mode.

NOTE
The operation of this parameter varies between the T series and M series.
For the T series: This parameter is valid when bit 4 (EVS) of parameter No. 3705 is set to 1.
For the M series: For an S command for maximum spindle speed clamping (G92S-- - ;), SF is not output, regardless of the setting of this parameter.

 # 1 GST The SOR signal is used for:

0: Spindle orientation

1: Gear shift

 # 2 SGB Gear switching method

0: Method A (Parameters 3741 to 3743 for the maximum spindle speed at each gear are used for gear selection.)

1: Method B (Parameters 3751 and 3752 for the spindle speed at the gear switching point are used for gear selection.)

 # 3 SGT Gear switching method during tapping cycle (G84 and G74)

0: Method A (Same as the normal gear switching method)

1: Method B (Gears are switched during tapping cycle according to the spindle speed set in parameters 3761 and 3762).

 # 4 EVS When the spindle control function (Spindle analog output or Spindle serial output) is used, S codes and SF are:

0: Not output for an S command.
1: Output for an S command.

The output of S codes and SF for an S command in constant surface speed control mode (G96), or for an S command used to specify maximum spindle speed clamping (G50S---;) depends on the setting of bit 0 (ESF) of parameter No.3705.

 # 5 NSF For the M series, when a T type gear is selected (with bit 4 (GTT) of parameter No. 3706 set to 1 or with the option for constant surface speed control), and an S code is specified:

0: SF is output.
1: SF is not output.

> **NOTE**
> This parameter does not affect S code output. For an S command for maximum spindle speed clamping (G92S-- - ;), SF is not output, regardless of the setting of this parameter.

 # 6 SFA The SF signal is output:

0: When gears are switched.
1: Irrespective of whether gears are switched.

	#7	#6	#5	#4	#3	#2	#1	#0
3706	TCW	CWM	ORM		PCS	MPA		
	TCW	CWM	ORM	GTT	PCS	MPA		

[Input type] Parameter input
[Data type] Bit path

 # 2 MPA If a spindle is to be selected using a P command (with bit 3 (MPP) of parameter No. 3703 set to 1) in multi-spindle control, and a P command is not specified together with an S command:

0: The alarm (PS5305) is issued.
1: The last P specified by S_ P_; (by S_ P_; specified for the path in case of a multi-path system) is used. If P is not specified even once after power-up, the value of parameter No. 3775 is used.

> **NOTE**
> This parameter is valid only when bit 3 (MPP) of parameter No. 3703 is set to 1.

 # 3 **PCS** When a multi-path system is used, and multi-spindle control is enabled with each path, as the position coder signals (PC2SLC<Gn0028.7>, PC3SLC<Gn0026.0>, PC4SLC<Gn0026.1>) for selecting the position coder of a spindle among the multiple spindles that belong to a path selected by the inter-path spindle feedback selection signals:

0: The signals of the path selected by the inter-path spindle feedback selection signal are used.
1: The signals of the local path are used.

Suppose that path x is selected by the inter-path spindle feedback selection signals (SLPCA<Gn063.2> to SLPCD<Gn063.5>). Then, the following position coder is selected in path x by the position coder selection signals:
n = m(path number)-1
y = x(path number selected by the spindle feedback selection signals)-1

(1) When bit 3 (PCS) of parameter No. 3706 is set to 0

Position coder selected in path m	Selected path Position coder selection signals (path x)			Selecting path Position coder selection signals (path m)		
	PC2SLC <Gy028.7>	PC3SLC <Gy026.0>	PC4SLC <Gy026.1>	PC2SLC <Gn028.7>	PC3SLC <Gn026.0>	PC4SLC <Gn026.1>
PC1 of path x	0	0	0	-	-	-
PC2 of path x	1	0	0	-	-	-
PC3 of path x	0	1	0	-	-	-
PC4 of path x	0	0	1	-	-	-

When bit 3 (PCS) of parameter No. 3706 is set to 1

Position coder selected in path m	Selected path Position coder selection signals (path x)			Selecting path Position coder selection signals (path m)		
	PC2SLC <Gy028.7>	PC3SLC <Gy026.0>	PC4SLC <Gy026.1>	PC2SLC <Gn028.7>	PC3SLC <Gn026.0>	PC4SLC <Gn026.1>
PC1 of path x	-	-	-	0	0	0
PC2 of path x	-	-	-	1	0	0
PC3 of path x	-	-	-	0	1	0
PC4 of path x	-	-	-	0	0	1

 # 4 **GTT** Selection of a spindle gear selection method
0: Type M.
1: Type T.

NOTE

1 M type
The gear selection signal is not input. The CNC selects a gear based on the speed range of each gear set by a parameter beforehand according to S codes, and the selected gear is posted by outputting the gear selection signal. Moreover, the spindle speed matching the gear selected by the output gear selection signal is output.
T type
The gear selection signal is input. The spindle speed matching the gear selected by this signal is output.

2 When the constant surface speed control option is selected, type T is selected, regardless of whether this parameter is specified.

3 When type T spindle gear switching is selected, the following parameters have no effect:
No.3705#2(SGB), No.3751, No.3752, No.3705#1(GST), No.3705#3(SGT), No.3761, No.3762, No.3705#6(SFA), No.3735, No.3736
On the other hand, parameter No. 3744 becomes usable.

 # 5 ORM Voltage polarity during spindle orientation
0: Positive
1: Negative

 # 6 CWM
 # 7 TCW Voltage polarity when the spindle speed voltage is output

TCW	CWM	Voltage polarity
0	0	Both M03 and M04 positive
0	1	Both M03 and M04 negative
1	0	M03 positive, M04 negative
1	1	M03 negative, M04 positive

	#7	#6	#5	#4	#3	#2	#1	#0
3708		TSO	SOC				SAT	SAR
		TSO	SOC					SAR

[Input type] Parameter input
[Data type] Bit path

 # 0 SAR The spindle speed arrival signal (SAR) is:
0: Not checked
1: Checked

 # 1 SAT Check of the spindle speed arrival signal at the start of executing the thread cutting block
0: The signal is checked only when SAR, #0 of parameter 3708, is set.
1: The signal is always checked irrespective of whether SAR is set.

> **NOTE**
> When thread cutting blocks are consecutive, the spindle speed arrival signal is not checked for the second and subsequent thread cutting blocks.

 # 5 SOC During constant surface speed control (G96 mode), the speed clamp by the maximum spindle speed clamp command (M series: G92 S_; T series: G50 S_;) is carried out:
0: Before spindle speed override.
1: After spindle speed override.
If this parameter is set to 0, the spindle speed may exceed the maximum spindle speed (numeric value following S in G92 S_; (M series) or G50 S_; (T series)).
If this parameter is set to 1, the spindle speed is limited to the maximum spindle speed.
The spindle speed is limited to the upper limit of spindle speed specified in parameter No. 3772, irrespective of the setting of this parameter.

 # 6 TSO During a threading or tapping cycle, the spindle override is:
0: Disabled (tied to 100%).
1: Enabled.

> **NOTE**
> During rigid tapping, the override is tied to 100%, irrespective of the setting of this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
3709					MRS	MSI	RSC	SAM

[Input type] Parameter input
[Data type] Bit path

 # 0 SAM The sampling frequency to obtain the average spindle speed
0: 4 (Normally, set to 0.)
1: 1

 # 1 RSC In the constant surface speed control mode, the surface speed of a rapid traverse block is calculated:
0: In accordance with the coordinates of the end point.
1: In accordance with the current value, as in cutting feed.

 # 2 MSI In multi-spindle control, the SIND signal is valid
0: Only when the first spindle is valid (SIND signal for the 2nd, 3rd spindle becomes ineffective) (TYPE-A)

1: For each spindle irrespective of whether the spindle is selected (Each spindle has its own SIND signal). (TYPE-B)

 # 3 MRS When the actual spindle speed signals and S 12-bit code signals are output in multi-spindle control:
0: The signals common to the first spindle and second spindle are used, and the signals for the spindle selected by the spindle selection signal are output.
1: The signals for the first spindle and the signals for the second spindle are output separately.

	#7	#6	#5	#4	#3	#2	#1	#0
3710		CSL						

[Input type] Parameter input
[Data type] Bit path

 # 6 CSL An axis for which fine acceleration/deceleration is disabled in the Cs contour control mode is:
0: Selected by the signal (CDFn <G0127>) from the PMC.
1: Axis interpolated with the Cs contour control axis specified by parameter No. 39n0 (n=0 to 4), or axis for which bit 7 (ALG) of parameter No. 1814 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
3715								NSAx

[Input type] Parameter input
[Data type] Bit axis

 # 0 NSAx When a move command is executed for an axis, the spindle speed arrival signal SAR is:
0: Checked.
1: Not checked.
Set an axis for which the spindle speed arrival signal SAR need not be checked when a move command is executed for the axis. When a move command is specified only for an axis with this parameter set to 1, the spindle speed arrival signal SAR is not checked.

	#7	#6	#5	#4	#3	#2	#1	#0
3716								A/Ss

[Input type] Parameter input
[Data type] Bit spindle

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 A/Ss Spindle motor type is :
0: Analog spindle. (Prohibition of use)
1: Serial spindle.

> **NOTE**
> 1 When an analog spindle is used, the option for spindle analog output is required.
> 2 When a serial spindle is used, the option for spindle serial output is required.
> 3 The option for the number of controlled spindles needs to be specified.

3717	Motor number to each spindle

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to Maximum number of controlled axes

Set a spindle amplifier number to be assigned to each spindle.
0: No spindle amplifier is connected.
1: Spindle motor connected to amplifier number 1 is used.
2: Spindle motor connected to amplifier number 2 is used.
to
n: Spindle motor connected to amplifier number n is used.

3718	Subscript for display of a serial spindle (main spindle) or analog spindle

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to 122

Set a subscript to be added to spindle speed display on a screen such as the position display screen.

3719	Subscript for display of a serial spindle (sub-spindle)

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to 122

Set a subscript to be added to spindle speed display on a screen such as the position display screen.

3720	Number of position coder pulses

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] Detection unit
[Valid data range] 1 to 32767

Set the number of position coder pulses.

3721	Number of gear teeth on the position coder side

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 9999

Set the number of gear teeth on the position coder side in speed control (such as feed per revolution and threading).

3722	Number of gear teeth on the spindle side

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 9999

Set the number of gear teeth on the spindle side in speed control (such as feed per revolution and threading).

	#7	#6	#5	#4	#3	#2	#1	#0
3729								ORTs

[Input type] Parameter input
[Data type] Bit spindle

 # 0 ORTs When a serial spindle is used, the spindle orientation function of stop position external setting type based on the position coder is:
0: Not performed.
1: Performed.

3730	Data used for adjusting the gain of the analog output of spindle speed

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] 0.1%
[Valid data range] 700 to 1250

Set data used for adjusting the gain of the analog output of spindle speed.

[Adjustment method]
<1> Assign standard value 1000 to the parameter.
<2> Specify the spindle speed so that the analog output of the spindle speed is the maximum voltage (10 V).
<3> Measure the output voltage.
<4> Assign the value obtained by the following equation to parameter No.3730.
Setting value = (10 (V) / Measured data (V)) × 1000
<5> After setting the parameter, specify the spindle speed so that the analog output of the spindle speed is the maximum voltage. Confirm that the output voltage is 10V.

NOTE
This parameter needs not to be set for serial spindles.

3731	Compensation value for the offset voltage of spindle speed analog output

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Velo
[Valid data range] -1024 to 1024

Set a compensation value for the offset voltage of spindle speed analog output.
Setting = -8191 × offset voltage (V)/12.5

[Adjustment method]
<1> Assign standard value 0 to the parameter.
<2> Specify the spindle speed so that the analog output of the spindle speed is 0.
<3> Measure the output voltage.
<4> Assign the value obtained by the following equation to parameter No.3731.
Setting value = (-8191 × Offset voltage (V)) / 12.5
<5> After setting the parameter, specify the spindle speed so that the analog output of the spindle speed is 0. Confirm that the output voltage is 0V.

NOTE
This parameter needs not to be set for serial spindles.

3732	The spindle speed during spindle orientation or the spindle motor speed during spindle gear shift

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 20000

Set the spindle speed during spindle orientation or the spindle motor speed during gear shift.

When GST, #1 of parameter 3705, is set to 0, set the spindle speed during spindle orientation in min^{-1}.

When GST, #1 of parameter 3705, is set to 1, set the spindle motor speed during spindle gear shift calculated from the following formula.

For a serial spindle

Setting value =
(Spindle motor speed during spindle gear shift / Maximum spindle motor speed) × 16383

For an analog spindle

Setting value =
(Spindle motor speed during spindle gear shift / Maximum spindle motor speed) × 4095

3735	
	Minimum clamp speed of the spindle motor

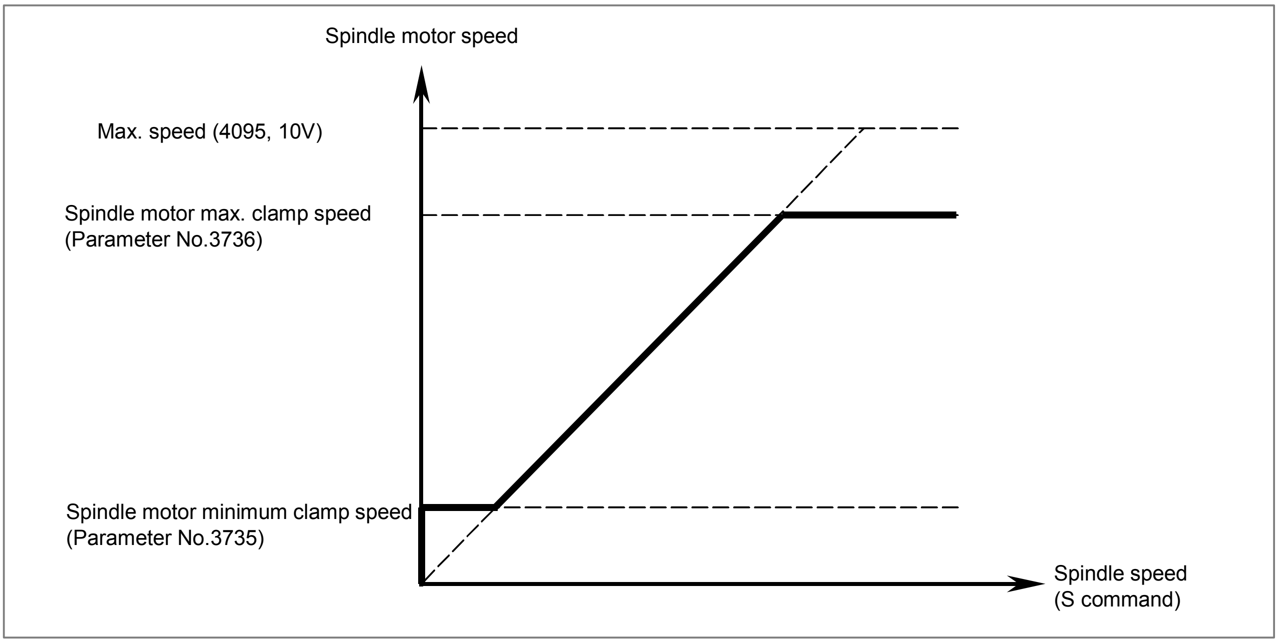
[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 4095

Set the minimum clamp speed of the spindle motor.
Setting value =
(Minimum clamp speed of the spindle motor / Maximum spindle motor speed) × 4095

3736	
	Maximum clamp speed of the spindle motor

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 4095

Set the maximum clamp speed of the spindle motor.
Setting value =
(Maximum clamp speed of the spindle motor / Maximum spindle motor speed) × 4095



3738	Spindle name 2 of each spindle

3739	Spindle name 3 of each spindle

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 48to57,65to90

The command for a spindle is basically "S".

When all conditions below are satisfied, however, an extended spindle name can be used. An extended spindle name consists of up to three characters starting with "S" as the first spindle name. Thus, a command for a spindle can be specified.

- The serial (analog) spindle function is enabled.
- The multi-spindle function is enabled.
- Bit 0 (EEA) of parameter No. 1000 is set to 1.
- Bit 3 (MPP) of parameter No. 3703 is set to 1.
- Bit 1 (ESN) of parameter No. 3798 is set to 1.
- Bit 4 (GTT) of parameter No. 3706 is set to 1. (M series only)

As spindle name 2 (No. 3738) and spindle name 3 (No. 3739), ASCII codes from 0 to 9 and A to Z can be arbitrary set. However, before spindle name 3 for a spindle can be valid, spindle name 2 must be set for the spindle. Moreover, when a character from 0 to 9 is set as spindle name 2, do not set a character from A to Z as spindle name 3.

NOTE

1. When an extended spindle name is used, a subscript (for a main spindle (parameter No. 3718)) and a subscript (for a sub-spindle (parameter No. 3719)) are unusable.
2. When the custom macro function is enabled, the same extended spindle name as a reserved word must not be used. Such an extended spindle name is regarded as a reserved word.

3740	Time elapsed prior to checking the spindle speed arrival signal

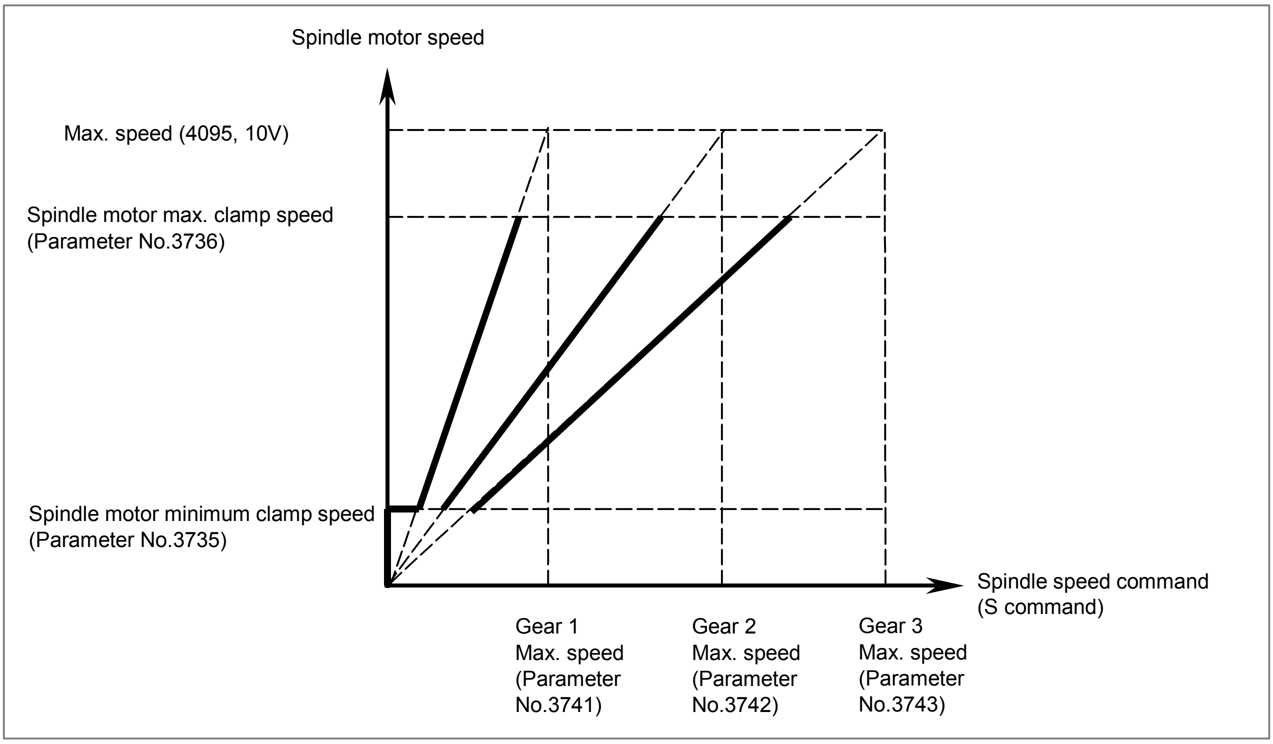
[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767

Set the time elapsed from the execution of the S function up to the checking of the spindle speed arrival signal.

3741	Maximum spindle speed for gear 1
3742	Maximum spindle speed for gear 2
3743	Maximum spindle speed for gear 3
3744	Maximum spindle speed for gear 4

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

Set the maximum spindle speed corresponding to each gear.

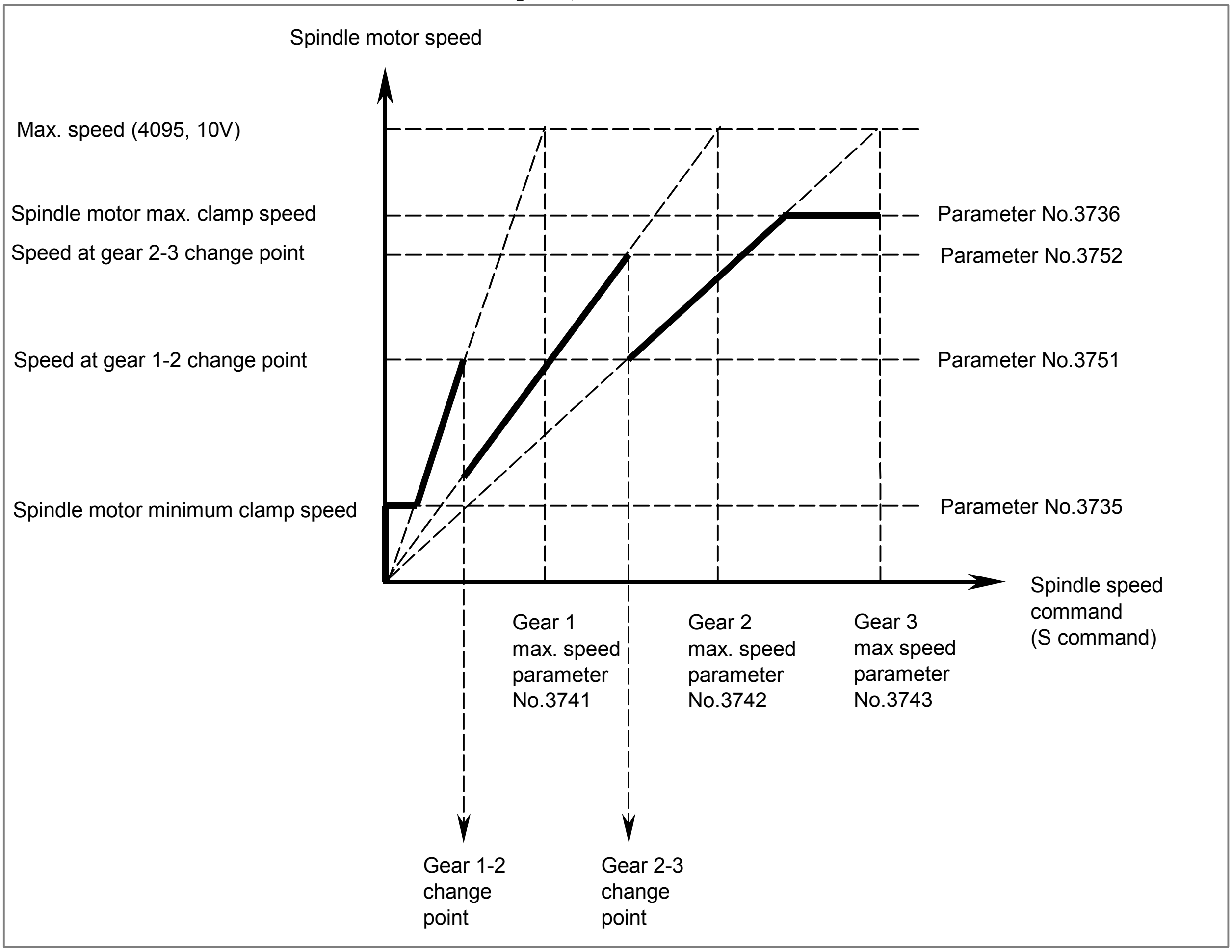


3751	Spindle motor speed when switching from gear 1 to gear 2
3752	**Spindle motor speed when switching from gear 2 to gear 3**

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 4095

For gear switching method B, set the spindle motor speed when the gears are switched.

Setting value =
(Spindle motor speed when the gears are switched / Maximum spindle motor speed) × 4095

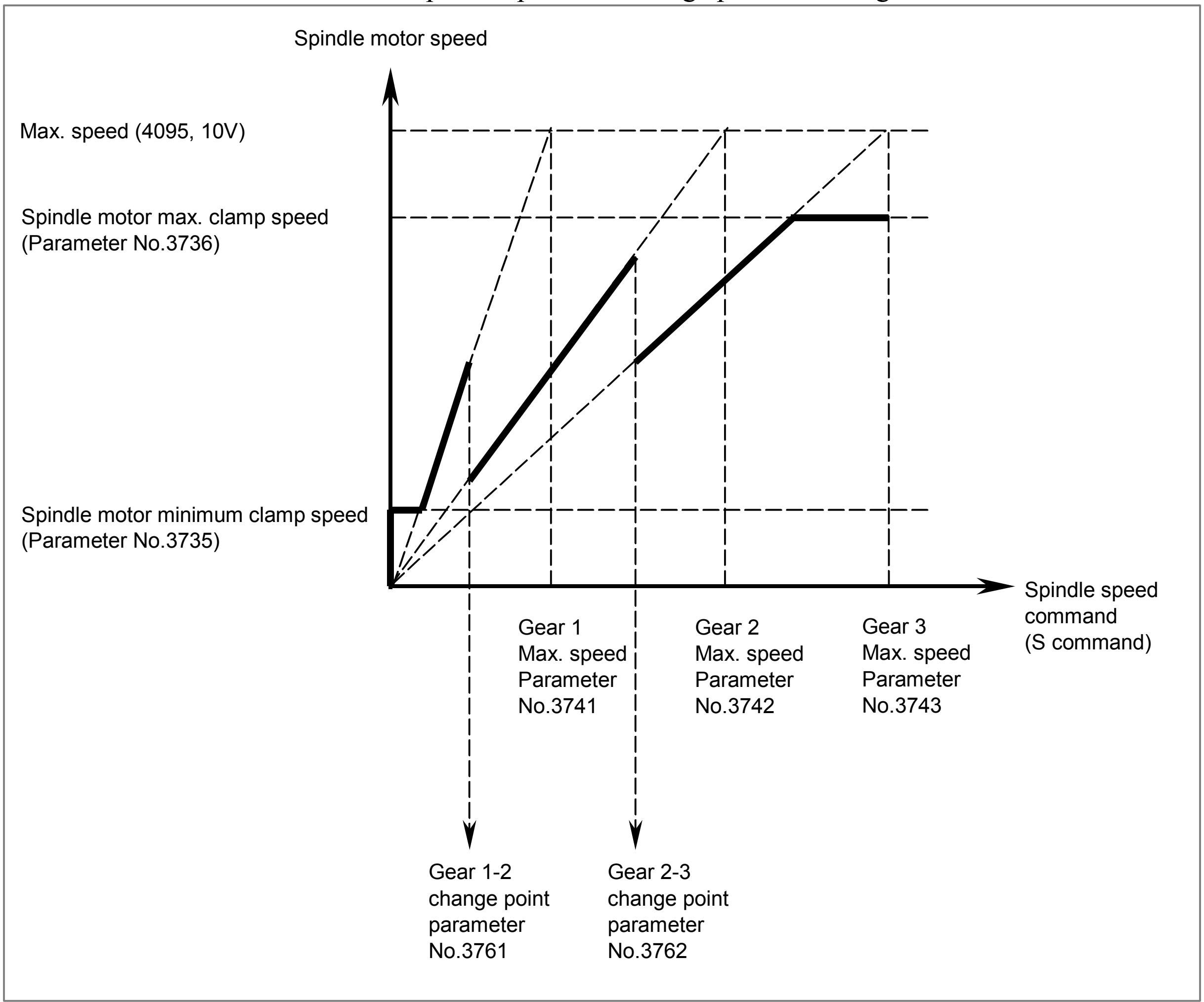


3761	Spindle speed when switching from gear 1 to gear 2 during tapping

3762	Spindle speed when switching from gear 2 to gear 3 during tapping

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

When method B is selected as the gear change method in the tapping cycle (when bit 3 (SGT) of parameter No. 3705 is set to 1), set the spindle speed at a change point of each gear.



3770	Axis as the calculation reference in constant surface speed control

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the axis as the calculation reference in constant surface speed control.

> **NOTE**
> When 0 is set, constant surface speed control is always applied to the X-axis. In this case, specifying P in a G96 block has no effect on the constant surface speed control.

3771	Minimum spindle speed in constant surface speed control mode (G96)

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] min^{-1}
[Valid data range]

Set the minimum spindle speed in the constant surface speed control mode (G96).
The spindle speed in constant surface speed control is clamped to the speed given by parameter 3771.

3772	Maximum spindle speed

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

This parameter sets the maximum spindle speed.
When a command specifying a speed exceeding the maximum speed of the spindle is specified , or the speed of the spindle exceeds the maximum speed because of the spindle speed override function, the spindle speed is clamped at the maximum speed set in the parameter.

> ⚠ **CAUTION**
> 1 When 0 is set in this parameter, the speed of the spindle is not clamped.
> 2 When spindle speed command control is applied using the PMC, this parameter has no effect, and the spindle speed is not clamped.

> **NOTE**
> 1 For M series, this parameter is valid if the function of constant surface speed control is provided.
> 2 When the constant surface speed control option is selected, the spindle speed is clamped at the maximum speed, regardless of whether the G96 mode or G97 mode is specified.

3775	Default P command value for spindle selection in multi-spindle control

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0, 1to32767

When bit 3 (MPP) of parameter No. 3703 is set to 1 and bit 2 (MPA) of parameter No. 3706 is set to 1 in multi-spindle control, set a default P command value applicable if S_P_ is not specified even once after power-up.

3781	P code for selecting the spindle in multi-spindle control

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 0 to 32767

If bit 3 (MPP) of parameter No. 3703 is set to 1, set the P code to select each spindle under multi-spindle control. Specify the P code in a block containing the S command.

Example)
If the P code value for selecting the second spindle is set to 3,
S1000 P3;
causes the second spindle to rotate at S1000.

> **NOTE**
> 1 This parameter is valid if bit 3 (MPP) of parameter No. 3703 is set to 1.
> 2 If this parameter is set to 0, the corresponding spindle cannot be selected by a P code.
> 3 Under multipath control, the P code specified here is valid for each path.
> For instance, if the P code to select the first spindle of path 2 is set to 21, specifying S1000 P21; in path 1 causes the first spindle of path 2 to be rotated at S1000.

> **NOTE**
> 4 Identical P code values cannot be used for different spindles. (Identical P code values cannot be used even if the paths are different.)
> 5 When this parameter is used (when bit 3 (MPP) of parameter No. 3703 is set to 1), the spindle command selection signal is invalid.
> 6 To use this parameter, the multi-spindle control function is needed.

	#7	#6	#5	#4	#3	#2	#1	#0
3798							ESN	ALM

[Input type] Parameter input
[Data type] Bit

 # 0 ALM The spindle alarm (SP****) for all spindles is:
0: Enabled.
1: Ignored.
When this parameter is set to 1, the spindle-related alarms are ignored. So, be sure to set this parameter to 0 at all times except for special cases such as maintenance.

 # 1 ESN When the multi-spindle function is enabled and bit 3 (MPP) of parameter No. 3703 is set to 1, a spindle is specified in a program by using:
0: P command.
1: Extended spindle name.

A spindle to be specified is selected as follows:

ESN (No.3798#1)	MPP (No.3703#3)	Selection method
0	0	Signal selection
0	1	P command
1	0	Signal selection
1	1	Extended spindle name

> **NOTE**
> This parameter is valid when bit 0 (EEA) of parameter No. 1000 is set to 1.
> When setting this parameter to 1, set also parameter No. 3738 and No. 3739 properly.

	#7	#6	#5	#4	#3	#2	#1	#0
3799					SVPs	ASDs	NDPs	NALs

[Input type] Parameter input
[Data type] Bit spindle

 # 0 NALs An alarm detected on the spindle amplifier side is:
0: Displayed.
1: Not displayed.
(This parameter is valid when bit 0 (ALM) of parameter No. 3798 is set to 0.)
When this parameter is set to 1, an alarm detected on the spindle amplifier side is ignored. So, be sure to set this parameter to 0 at all times except for special cases such as maintenance.

 # 1 NDPs When an analog spindle is used, a position coder disconnection check is:
0: Made.
1: Not made.
(This parameter is valid when bit 0 (NAL) of parameter No. 3799 is set to 0.)
When no position coder is used with an analog spindle, set this parameter to 1.

 # 2 ASDs When a serial spindle is used, a spindle speed is calculated based on:
0: Feedback pulses from the position coder.
1: Speed monitor.

 # 3 SVPs As synchronization errors displayed on the spindle screen:
0: Monitor values are displayed.
1: Peak-hold values are displayed,
Spindle synchronization errors are displayed on the side of the spindle that functions as a slave axis in spindle synchronization control.

Parameters for Control of Serial Interface Spindle Cs Contouring Control Axis

Number	Data format	Description	
3900	Byte path	First group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3901 to 3904 when the Cs contouring axis is controlled
3901	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3902	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3903	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3904	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection

Parameters for Control of Serial Interface Spindle Cs Contouring Control Axis

Number	Data format		Description
3910	Byte path	Second group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3911 to 3914 when the Cs contouring axis is controlled
3911	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3912	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3913	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3914	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection
3920	Byte path	Third group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3921 to 3924 when the Cs contouring axis is controlled
3921	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3922	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3923	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3924	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection
3930	Byte path	Fourth group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3931 to 3934 when the Cs contouring axis is controlled
3931	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3932	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3933	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3934	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection
3940	Byte path	Fifth group	Number of the servo axis whose loop gain is to be changed according to the set values of parameters 3941 to 3944 when the Cs contouring axis is controlled
3941	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 1 selection
3942	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 2 selection
3943	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 3 selection
3944	Word path		Loop gain for the servo axis when the Cs contouring axis is controlled for spindle gear 4 selection

<Setting method>

First, select servo axes which perform interpolation with the Cs contouring axis. (Up to five axes can be selected.)

When there is no servo axis for interpolation with the Cs contouring axis, set the parameters 3900, 3910, 3920, 3930, and 3940 to 0 to terminate parameter setting.

When there are servo axes for interpolation with the Cs contouring axis, the parameters must be set according to the procedure below for each axis.

(1) Set the number of a servo axis (1 to maximum number of controlled axes) for interpolation with the Cs contouring axis in parameters 39n0 (n = 0, 1, 2, 3, and 4).
(2) Set loop gain values of the servo axis specified in (1) above which is used when the Cs contouring axis is controlled in parameters 39n1, 39n2, 39n3, and 39n4. (There are four stages for main gears used.)
(3) When the number of specified servo axes is less than 5, set the remaining parameters (39n0) to 0 to terminate parameter setting.

When the number of a Cs contouring axis is set to parameter 39n0, the parameter is assumed to be set to 0.

NOTE

1 In general, it is difficult to set a high loop gain for a spindle motor axis when compared with a servo axis. These parameters are provided so that, by changing the loop gain of a servo axis that requires interpolation with the Cs contour axis, interpolation control can be exercised correctly between the Cs axis and servo axis while the spindle exercises Cs contour control.

2 The loop gain of the servo axis is changed using the parameter settings made for a spindle gear selected at the time of conversion from the spindle mode to the Cs contour control mode.
In normal use, it is unlikely that the gear of the spindle is switched during Cs contour control. However, note that if the gear of the spindle is changed during Cs contour control, the loop gain of the servo axis is not changed.

3 Even when multiple Cs axes are used with one path (bit 7 (CSS) of parameter No. 3704 = 1), these parameters are shared.

Parameters for Serial interface spindle or spindle

Parameters Nos. 4000 to 4539 below are basically used with the serial spindle amplifier (SPM). For details of these parameters, refer to either of the following manuals and other related documents, depending on the spindle that is actually connected.

- FANUC AC SPINDLE MOTOR α*i* series Parameter Manual (B-65280EN)

	#7	#6	#5	#4	#3	#2	#1	#0
4000								
to	to							
4015	(No user setting allowed = Note 1)							
to	to							
4019	(Note 2)							

[Input type] Parameter input
[Data type] Bit spindle

4020	
to	to
4133	

[Input type] Parameter input
[Data type] Word spindle

4134	

4135	

[Input type] Parameter input
[Data type] 2-word spindle

4136	
to	to
4175	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4176								
to	to							
4191	(No user setting allowed = Note 1)							
to	to							
4195	(Note 2)							

[Input type] Parameter input
[Data type] Bit spindle

4196	
to	to
4309	

[Input type] Parameter input
[Data type] Word spindle

4310	

4311	

[Input type] Parameter input
[Data type] 2-word spindle

4312	
to	to
4351	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4352								
4353								

[Input type] Parameter input
[Data type] Bit spindle

4354	
to	to
4371	(No user setting allowed = Note 1)

4372	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4373								
4374								

[Input type] Parameter input
[Data type] Bit spindle

4375	
to	to
4393	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4394								
to				to				
4403								

[Input type] Parameter input
[Data type] Bit spindle

4404	
to	to
4466	

[Input type] Parameter input
[Data type] Word spindle

	#7	#6	#5	#4	#3	#2	#1	#0
4467								
to				to				
4476								

[Input type] Parameter input
[Data type] Bit spindle

4477	
to	to
4539	

[Input type] Parameter input
[Data type] Word spindle

NOTE

1. Among the parameters of the spindle amplifier with the serial interface, parameters Nos. 4015 and 4191 cannot be changed by the users.
   These parameters require to assign optional software to the CNC and are automatically set depending on the type of the software.
   The setting of parameter No. 4371 is also unchangeable by the user.
2. To set the parameters of the spindle amplifier with the serial interface automatically, set #7 of parameter No.4019 (if the sub spindle is set in the CNC with the spindle switching function, use parameter No.4195) to 1, assign the model code of the motor to be used to parameter No.4133 (if the sub spindle is set in the CNC with the spindle switching function, use parameter No.4309), turn off the power of the CNC and spindle amplifier, and restart the CNC and spindle amplifier.
3. Parameters No.4000 to No.4539 are used in the processing on the spindle amplifier. For details of these parameters, refer to either of the following manuals, depending on the serial spindle that is actually used.
   - FANUC AC SPINDLE MOTOR αi series Parameter Manual (B-65270EN)

NOTE

4 The CNC can control up to eight spindle amplifiers with the serial interface. When the spindle amplifier provides the spindle switching function, one spindle amplifier can control two spindle motors using the switching function. The output switching function can be used in spindle motors to be connected. Up to sixteen spindles, or thirty two types, can be used by switching the spindle motors. (The number of spindles that can controlled simultaneously is the same as the number of spindle amplifiers, that is eight spindles.)

Parameters of the spindle amplifier with the serial interface correspond to the above functions as follows:

(1) Serial spindle parameters for the first to eighth spindles:
No.4000to4539 ”S1”to“S8”

(2) Parameter No.4000 to No.4175 "S1" to "S8":
When the spindle switching function is not provided, or for the main spindle in the spindle amplifier when the function is provided.
Parameter No.4176 to No.4351 "S1" to "S8":
For the sub spindle in the spindle amplifier when the spindle switching function is provided.

(3) Parameters at low speed when the output switching function is provided.
Parameters No.4136 to No.4175 "S1" to "S8":
When the spindle switching function is not provided, or for the main spindle when the function is provided.
Parameters No.4284 to No.4351 "S1" to "S8":
For the sub spindle when the spindle switching function is provided.

5 The CNC stores the parameters of the spindle amplifier with the serial interface. The CNC sends them to the spindle amplifier at the system power on and they are used in the unit.

These parameters are sent from the CNC to the spindle amplifier in a batch when:
- The CNC is switched on.

If these parameters are rewritten, they are sent from the CNC to the spindle amplifier sequentially when:
- The parameters have been entered from the MDI.
- The parameters have been entered as programmable (G10).
- The parameters have been entered via the reader/punch interface.

To set parameters automatically, upload parameters corresponding to the motor model from the spindle amplifier to the CNC prior to the procedure specified above.

The parameters of the spindle amplifier with serial interface can be changed after the system starts. Changing the parameters (No.4000 to No.4539 "S1" to "S8") in the CNC sends them to the spindle amplifier at an appropriate time and the parameters in the unit are updated.

(Be careful not to change parameters incorrectly.)

		#7	#6	#5	#4	#3	#2	#1	#0
4800		SPK	EPZ	SCB					

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 5 SCB The combination of a master spindle and slave spindle for spindle synchronization depends on:

0: Setting of bit 4 (SSS) of parameter No. 3704.
When bit 4 (SSS) of parameter No. 3704 is set to 0
The first spindle and second spindle of each path can be selected as the master spindle and slave spindle, respectively, for spindle synchronization.
When bit 4 (SSS) of parameter No. 3704 is set to 1
A combination of arbitrary spindles of each path can be selected for spindle synchronization.
Set a master spindle for each slave spindle in parameter No. 4831. Set a spindle number of each path.
By setting a spindle number common to the system in parameter No. 4832, an arbitrary spindle that belongs to a different path can be selected as a master spindle for spindle synchronization. Set a spindle number common to the system. Set parameter No. 4831 to 0. Spindle synchronization based on arbitrary spindles must be enabled for the path to which a slave spindle belongs and for the path to which a master spindle belongs.

1: Conventional 16TT system compatible specifications.
The first spindle of path 1 and the first spindle of path 2 can be selected as the master spindle and slave spindle, respectively, for spindle synchronization.
As control signals, the signal interface of the 16TT system compatible specifications can be used.

 # 6 EPZ When the parking signal is switched in the reference position established state during Cs contour control exercised using simple spindle synchronous control:

0: Reference position established state is continued.
1: Reference position established state is canceled.

If this parameter is set, the same reference position return operation as manual reference position return is performed with the G28 command immediately after the parking signal is switched.
The G00 command performs a positioning operation including reference position return (when bit 1 (NRF) of parameter No. 3700 is set to 0).

 # 7 SPK As the parking signals for simple spindle synchronous control:

0: PKESS1<Gn122.6> (first spindle) and PKESS2<Gn122.7> (second spindle) are used.

1: PKESS1<Gn031.6> (first spindle) and PKESS2<Gn031.7> (second spindle) are used.

> **NOTE**
> 1 This parameter is valid only when bit 5 (SSY) of parameter No. 3704 is set to 0.
> 2 If the parking signals PK7 and PK8 for synchronization control are used when simple spindle synchronous control and synchronization control are used at the same time, set bit 7 (SPK) of parameter No. 4800 to 1 to use the parking signals PKESS1 and PKESS2 for simple spindle synchronous control as <Gn031.6,Gn031.7>.

	#7	#6	#5	#4	#3	#2	#1	#0
4801								SNDs

[Input type] Parameter input
[Data type] Bit spindle

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 SNDs During spindle synchronization control, the rotation direction of each spindle motor is:

0: Same as the specified sign.

1: Opposite to the specified sign.

4810	Error pulse between two spindles when synchronizing phases in the spindle synchronization control mode

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 255

Set an allowable error pulse value between two spindles at phase synchronization time in the spindle synchronization control mode.

This parameter is used to check the completion of phase synchronization performed in the spindle synchronization control mode and to check the phase difference during spindle synchronization control.

When the error pulse value between two spindles become equal to or less than the value set in this parameter, the spindle phase synchronization control completion signals FSPPH<F044.3> and FSPPH1 to 4<F289.0 to 3> are set to 1.

4811	Allowable error count for the error pulses between two spindles in the spindle synchronization control mode

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 32767

Set the allowable error count for the error pulses between two spindles in the spindle synchronization control mode.
This parameter is used to check a spindle synchronization error phase difference.
When a spindle synchronization error equal to or greater than the value set in this parameter is detected, the phase error monitor signals SYCAL<F044.4> and SYCAL1 to 4<F043.0 to 3> are set to 1.

4821	Master axis of each slave spindle under simple synchronous spindle control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to Maximum number of controlled axes (within a path)

When a spindle is set as a slave spindle in simple spindle synchronous control on each spindle, set which spindle (master spindle) the slave spindle is to be synchronized with.

Examples of parameter setting)

- When simple spindle synchronous control is exercised with the first spindle selected as a master spindle and the second spindle selected as a slave spindle
  No.4821(1)=1
  No.4821(2)=1
  No.4821(3)=0
  No.4821(4)=0

- When simple spindle synchronous control is exercised with four spindles under the following combinations:
  (Two combinations, namely, first spindle (master spindle)/ second spindle (slave spindle), and third spindle (master spindle)/fourth spindle (slave spindle))
  No.4821(1)=0
  No.4821(2)=1
  No.4821(3)=0
  No.4821(4)=3

> **NOTE**
> 1 This parameter is valid if bit 5 (SSY) of parameter No. 3704 is set to 1.
> 2 The setting of a slave spindle as a master spindle is invalid. Be sure to set 0 for a spindle that is to function as a master spindle.
> 3 In this parameter, set a spindle number within the same path.

4826	Allowable error count for the error pulses between two spindles in the simple synchronization spindle control mode

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 32767

Set the allowable error count for the error pulses between two spindles in the simple synchronization spindle control mode.
This parameter is used to check a spindle synchronization error phase difference.
When a spindle synchronization error equal to or greater than the value set in this parameter is detected, the spindle phase error monitor signals SYCAL<Fn044.4> and SYCALs are set to 1.

> **NOTE**
> 1 The detection unit per pulse depends on the spindle control mode (Cs contour control, rigid tapping, or spindle positioning).
> 2 Set this parameter for a spindle that is to function as a slave spindle. Set 0 for the master spindle.
> 3 In the spindle rotation control mode, synchronization error detection is not performed.

4831	Master axis of each slave spindle under spindle synchronous control

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to Maximum number of controlled axes (within a path)

When a spindle is set as a slave spindle in spindle synchronization control on each spindle, set which spindle (master spindle) the slave spindle is to be synchronized with.
Examples of parameter setting)

- When spindle synchronization control is exercised with the first spindle selected as a master spindle and the second spindle selected as a slave spindle
  No.4831(1)=0

No.4831(2)=1
No.4831(3)=0
No.4831(4)=0

- When spindle synchronization control is exercised with four spindles under the following combinations:
  (Two combinations, namely, first spindle (master spindle)/second spindle (slave spindle), and third spindle (master spindle)/fourth spindle (slave spindle))
  No.4831(1)=0
  No.4831(2)=1
  No.4831(3)=0
  No.4831(4)=3

- When spindle synchronization control is exercised with one master spindle and multiple slave spindles
  (First spindle (master spindle)/second spindle (slave spindle)/third spindle (slave spindle)/fourth spindle (slave spindle))
  No.4831(1)=0
  No.4831(2)=1
  No.4831(3)=1
  No.4831(4)=1

NOTE

1. This parameter is valid if bit 4 (SSS) of parameter No. 3704 is set to 1.
2. The setting of a slave spindle as a master spindle is invalid. Be sure to set 0 for a spindle that is to function as a master spindle.
3. In this parameter, set a spindle number within the same path.
   When a spindle not belonging to the local path is to be selected as a master spindle for spindle synchronization, set a spindle number common to the system in parameter No. 4832. In such a case, set 0 in this parameter.

4832	Master spindle of each slave spindle under spindle synchronization control (spindle number common to the system)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to Maximum number of controlled axes (common to the system)

When a spindle is set as a slave spindle in spindle synchronization control on each spindle, set which spindle (master spindle) the slave spindle is to be synchronized with.

NOTE
1 This parameter is valid if bit 4 (SSS) of parameter No. 3704 is set to 1.
Bit 4 (SSS) of parameter No. 3704 must be set to 1 (to enable spindle synchronization based on arbitrary spindles) for the path to which a slave spindle belongs and for the path to which a master spindle belongs.
2 The setting of a slave spindle as a master spindle is invalid. Be sure to set 0 for a spindle that is to function as a master spindle.
3 In this parameter, set a spindle number common to the system. When this parameter is used, parameter No. 4831 is set to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
4900								**FLRs**

[Input type] Parameter input
[Data type] Bit spindle

 # 0 FLRs When the spindle speed fluctuation detection function is used, the unit of an allowable ratio (q) and fluctuation ratio (r) set by parameter No. 4911 and No. 4912 is:
0: 1%
1: 0.1%

4911	**Allowable speed ratio (q) used to assume that the spindle has reached a specified speed**

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] 1%, 0.1%
[Valid data range] 1 to 100, 1 to 1000

When the spindle speed fluctuation detection function is used, set an allowable speed ratio (q) used to assume that the spindle has reached a specified speed.

NOTE
The unit of data is determined by bit 0 (FLR) of parameter No. 4900.

4912	**Spindle variation ratio (r) for not issuing a spindle speed fluctuation detection alarm**

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] 1%, 0.1%
[Valid data range] 1 to 100, 1 to 1000

When the spindle speed fluctuation detection function is used, set a spindle fluctuation ratio (r) for not issuing an alarm.

NOTE
The unit of data is determined by bit 0 (FLR) of parameter No. 4900.

4913	Spindle speed fluctuation width (i) for not issuing a spindle speed fluctuation detection alarm

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 99999

When the spindle speed fluctuation detection function is used, set an allowable fluctuation width (i) for not issuing an alarm.

4914	Time (p) from the change of a specified speed until spindle speed fluctuation detection is started

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] msec
[Valid data range] 0 to 99999

When the spindle speed fluctuation detection function is used, set a time (p) from the change of a specified speed until spindle speed fluctuation detection is started. In other words, spindle speed fluctuation detection is not performed until a set time has elapsed after a specified speed is changed. However, when the actual spindle speed is assumed to have reached a specified value within a set time (p), spindle speed fluctuation detection is started.

	#7	#6	#5	#4	#3	#2	#1	#0
4950	IMBs	ESIs	TRVs			ISZs	IDMs	IORs

[Input type] Parameter input
[Data type] Bit spindle

 # 0 IORs Resetting the system in the spindle positioning mode
0: Does not releases the mode.
1: Releases the mode

 # 1 IDMs The direction of spindle positioning (half-fixed angle positioning based on M codes) is:
0: Plus direction.
1: Minus direction.

 # 2 ISZs When an M code for switching to the spindle positioning mode is specified for spindle positioning:
0: The spindle is switched to the spindle positioning mode, and spindle orientation operation is performed.
1: Only the switching of the spindle to the spindle positioning mode is performed. (Spindle orientation operation is not performed.)

 # 5 TRVs The rotation direction for spindle positioning is:
0: Same as the specified sign.
1: Opposite to the specified sign.

> **NOTE**
> When a serial spindle is used, this parameter is invalid for the specification of a rotation direction for the orientation command.

 # 6 ESIs The unit of rapid traverse rate on the spindle positioning axis is:
0: Not increased by a factor of 10.
1: Increased by a factor of 10.

 # 7 IMBs When the spindle positioning function is used, half-fixed angle positioning based on M codes uses:
0: Specification A
1: Specification B

In the case of half-fixed angle positioning based on M codes, three types of spindle positioning operations can occur:
(1) The spindle rotation mode is cleared, then the mode is switched to the spindle positioning mode. (After switching to the spindle positioning mode, spindle orientation operation is also performed.)
(2) Spindle positioning is performed in the spindle positioning mode.
(3) The spindle positioning mode is cleared, then the mode is switched to the spindle rotation mode.

- In the case of specification A:
  Operations (1) to (3) are specified using separate M codes.
  (1) Specified using an M code for switching to the spindle positioning mode.
  (See parameter No.4960)
  (2) Specified using M codes for specifying a spindle positioning angle.
  (See parameter No.4962)
  (3) Specified using M codes for clearing spindle positioning operation.
  (See parameter No.4961.)
- In the case of specification B:
  When M codes for specifying a spindle positioning angle are specified, operations (1) to (3) are performed successively. (See parameter No.4962.) (However, spindle orientation operation of (1) is not performed.)

4959	#7	#6	#5	#4	#3	#2	#1	#0
								DMDx

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 DMDx A machine coordinate on the spindle positioning axis is displayed in:
0: Degrees.
1: Pulses.

4960	M code specifying the spindle orientation

[Input type] Parameter input
[Data type] 2-word spindle
[Valid data range] 6 to 97
Set an M code for switching to the spindle positioning mode.

> **NOTE**
> 1 Do not set an M code that duplicates other M codes used for spindle positioning.
> 2 Do not set an M code used with other functions (such as M00-05, 30, 98, and 99, and M codes for calling subprograms).

4961	M code releasing the spindle positioning mode

[Input type] Parameter input
[Data type] 2-word spindle
[Valid data range] 6 to 97
Set an M code for canceling the spindle positioning mode on the spindle positioning axis.

> **NOTE**
> 1 Do not set an M code that duplicates other M codes used for spindle positioning.
> 2 Do not set an M code used with other functions (such as M00-05, 30, 98, and 99, and M codes for calling subprograms).

4962	M code for specifying a spindle positioning angle

[Input type] Parameter input
[Data type] 2-word spindle
[Valid data range] 6 to 9999999

Two methods are available for specifying spindle positioning. One method uses axis address for arbitrary-angle positioning. The other use an M code for half-fixed angle positioning. This parameter sets an M code for the latter method.

In this parameter, set an M code to be used for half-fixed angle positioning based on M codes.

Six M code from Mα to M(α+5) are used for half-fixed angle positioning, when a is the value of this parameter.

- When the number of M codes is set in parameter No. 4964, let α be the value set in parameter No. 4962, and let β be the value set in parameter No. 4964. Then, β M codes from Mα to M(α+β-1) are used as M codes for half-fixed angle positioning based on M codes.

The table below indicates the relationship between the M codes and positioning angles.

M code	Positioning angle	Example: Positioning angle when θ = 30°
Mα	θ	30°
M(α+1)	2θ	60°
M(α+2)	3θ	90°
M(α+3)	4θ	120°
M(α+4)	5θ	150°
M(α+5)	6θ	180°
:	:	:
M(α+β-1)	$\beta\times\theta$	$\beta\times$30°

β represents the number of M codes set in parameter No. 4964.
(When parameter No. 4964 is set to 0, β = 6.)
θ represents the basic angular displacement set in parameter No.4963.

NOTE

1 Do not set an M code that duplicates other M codes used for spindle positioning.
2 Do not set an M code used with other functions (such as M00-05, 30, 98, and 99, and M codes for calling subprograms).

4963	Basic angle for half-fixed angle positioning

[Input type] Parameter input
[Data type] Real spindle
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 to 60

This parameter sets a basic angular displacement used for half-fixed angle positioning using M codes.

4964	Number of M codes for specifying a spindle positioning angle

[Input type] Parameter input
[Data type] 2-word spindle
[Valid data range] 0 to 255

This parameter sets the number of M codes used for Half-fixed angle positioning using M codes.

As many M codes as the number specified in this parameter, starting with the M code specified in parameter No.4962, are used to specify half-fixed angle positioning.

Let α be the value of parameter No.4962, and let β be the value of parameter No.4964. That is, M codes from Ma to M(α+β-1) are used for half-fixed angle positioning.

Setting this parameter to 0 has the same effect as setting 6. That is, M code from Mα to M(α+5) are used for half-fixed angle positioning.

NOTE

1. Make sure that M codes from Ma to M (α+β-1) do not duplicate other M codes.
2. Do not set an M code that duplicates other M codes used for spindle positioning.
3. Do not set an M code used with other functions (such as M00-05, 30, 98, and 99, and M codes for calling subprograms).

4970	Position gain

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] 0.01/sec
[Valid data range] 1 to 9999

Set the position gain of the analog spindle in the spindle positioning mode.

4971	Position gain multiplier (first stage)
4972	Position gain multiplier (second stage)
4973	Position gain multiplier (third stage)
4974	Position gain multiplier (fourth stage)

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 1 to 32767

Set a position gain multiplier for an analog spindle in spindle positioning.

Position gain multiplier GC is obtained from the following equation:

$$GC = \frac{2048000 \times 360 \times PC \times E}{PLS \times SP \times L}$$

PLS Number of pulses output from the position coder (pulses/rev)
SP Number of gear teeth on the spindle side
PC Number of gear teeth on the position coder side
E Specified voltage (V) for turning the spindle motor at 1000 min^{-1}
L Angular displacement of the spindle (degrees) per spindle motor rotation

Example: For the spindle motor and gear ratio given below, GC is calculated as follows:

$$GC = \frac{2048000 \times 360 \times 1 \times 2.2}{4096 \times 1 \times 360} = 1100$$

PLS = 4096 pulse/rev
SP = 1
PC = 1
E = 2.2 V
L = 360 deg

NOTE
On the assumption that the spindle motor used turns at 4500 min^{-1} at 10 V, 2.2 V is required to turn the spindle motor at 1000 min^{-1}

4.20 PARAMETERS OF TOOL COMPENSATION (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
5000				ASG				SBK

[Input type] Setting input
[Data type] Bit path

 # 0 SBK With a block created internally for cutter compensation or tool nose radius compensation:
0: A single block stop is not performed.
1: A single block stop is performed.
This parameter is used to check a program including cutter compensation/tool nose radius compensation.

 # 4 ASG When tool compensation memory B/C (M series) or the tool geometry/wear compensation function (T series) is valid, the compensation amount to be modified by the active offset value change mode based on manual feed is:
0: Geometry compensation value
1: Wear compensation value

> **NOTE**
> This parameter is valid when the option for tool compensation memory B/C (M series) or tool geometry/wear compensation (T series) is specified.

	#7	#6	#5	#4	#3	#2	#1	#0
5001		EVO						
		EVO		EVR	TAL		TLB	TLC

[Input type] Parameter input
[Data type] Bit path

 # 0 TLC
 # 1 TLB These bits are used to select a tool length compensation type.

Type	TLB	TLC
Tool length compensation A	0	0
Tool length compensation B	1	0
Tool length compensation C	-	1

The axis to which cutter compensation is applied varies from type to type as described below.
Tool length compensation A :
Z-axis at all times
Tool length compensation B :
Axis perpendicular to a specified plane (G17/G18/G19)
Tool length compensation C :
Axis specified in a block that specifies G43/G44

 # 3 TAL Tool length compensation C

0: Generates an alarm when two or more axes are offset

1: Not generate an alarm even if two or more axes are offset

 # 4 EVR When a tool compensation value is changed in cutter compensation or tool nose radius compensation mode:

0: Enables the change, starting from that block where the next D or H code is specified.

1: Enables the change, starting from that block where buffering is next performed.

 # 6 EVO If a tool compensation value modification is made for tool length compensation A or tool length compensation B in the offset mode (G43 or G44):

0: The new value becomes valid in a block where G43, G44, or an H code is specified next.

1: The new value becomes valid in a block where buffering is performed next.

	#7	#6	#5	#4	#3	#2	#1	#0
5002	WNP	LWM	LGC	LGT		LWT	LGN	

[Input type] Parameter input
[Data type] Bit path

 # 1 LGN Geometry offset number of tool offset

0: Is the same as wear offset number

1: Specifies the geometry offset number by the tool selection number

> **NOTE**
> This parameter is valid when the option for tool geometry compensation or tool wear compensation is specified.

 # 2 LWT Tool wear compensation is performed by:

0: Moving the tool.

1: Shifting the coordinate system.

> **NOTE**
> This parameter is valid when the option for tool geometry compensation or tool wear compensation is specified.

 # 4 LGT Tool geometry compensation

0: Compensated by the shift of the coordinate system

1: Compensated by the tool movement

> **NOTE**
> This parameter is valid when the option for tool geometry compensation or tool wear compensation is specified.

 # 5 LGC When tool geometry compensation is based on coordinate shifting, the tool geometry offset is:
0: Not canceled by a command with offset number 0.
1: Canceled by a command with offset number 0.

> **NOTE**
> This parameter is valid when the option for tool geometry compensation or tool wear compensation is specified.

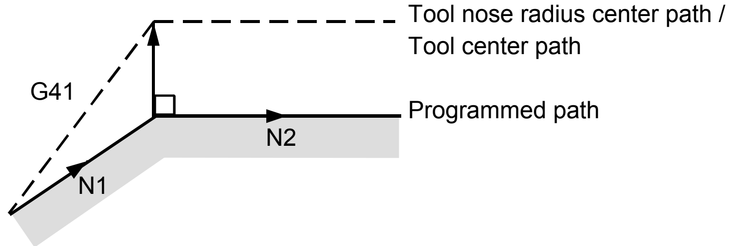
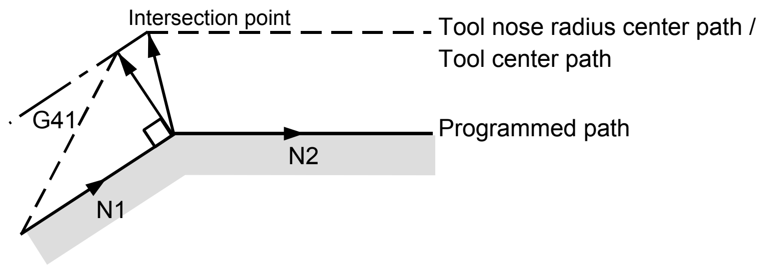
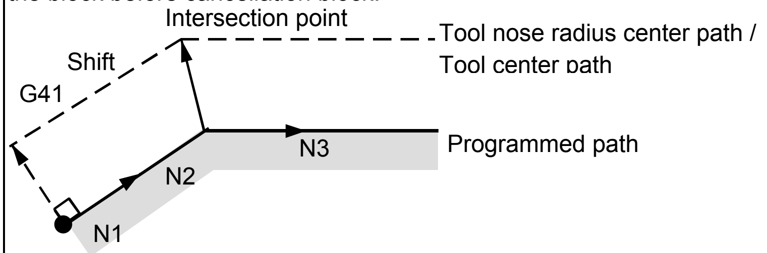
 # 6 LWM Tool offset operation based on tool movement is performed:
0: In a block where a T code is specified.
1: Together with a command for movement along an axis.

 # 7 WNP Imaginary tool tip number used for tool nose radius compensation, when the geometry/wear compensation function is equipped, is the number specified by:
0: Geometry offset number
1: Wear offset number

	#7	#6	#5	#4	#3	#2	#1	#0
5003	TGC	LVK					SUV	SUP
		LVK					SUV	SUP

[Input type] Parameter input
[Data type] Bit path

 # 0 SUP
 # 1 SUV These bits are used to specify the type of startup/cancellation of cutter compensation or tool nose radius compensation.

<table>
<tr><th>SUV</th><th>SUP</th><th>Type</th><th>Operation</th></tr>
<tr><td>0</td><td>0</td><td>Type A</td><td>A compensation vector perpendicular to the block next to the startup block or the block preceding the cancellation block is output.

</td></tr>
<tr><td>0</td><td>1</td><td>Type B</td><td>A compensation vector perpendicular to the startup block or cancellation block and an intersection vector are output.

</td></tr>
<tr><td>1</td><td>0
1</td><td>Type C</td><td>When the startup block or cancellation block specifies no movement operation, the tool is shifted by the cutter compensation amount in a direction perpendicular to the block next to the startup or the block before cancellation block.


When the block specifies movement operation, the type is set according to the SUP setting; if SUP is 0, type A is set, and if SUP is 1, type B is set.</td></tr>
</table>

> **NOTE**
> When SUV,SUP = 0,1 (type B), an operation equivalent to that of FS16i-T is performed.

 # 6 LVK Tool length compensation vector
0: Cleared by reset
1: Not cleared, but held by reset
The tool length compensation vector in the tool axis direction is handled in the same way by this bit.

 # 7 TGC A tool geometry offset based on a coordinate shift is:
0: Not canceled by reset.
1: Canceled by reset.

> **NOTE**
> This parameter is valid when the option for tool geometry compensation or tool wear compensation is specified.

	#7	#6	#5	#4	#3	#2	#1	#0
5004					TSI		ORC	
						ODI		

[Input type] Parameter input
[Data type] Bit path

 # 1 ORC The setting of a tool offset value is corrected as:
0: Diameter value
1: Radius value

> **NOTE**
> This parameter is valid only for an axis based on diameter specification. For an axis based on radius specification, specify a radius value, regardless of the setting of this parameter.

 # 2 ODI The setting of a cutter compensation/tool-nose radius compensation value is corrected as:
0: Radius value
1: Diameter value

 # 3 TSI For touch sensor contact detection with the function for direct input of offset value measured B:
0: Four-contact input is used.
1: One-contact input is used.

	#7	#6	#5	#4	#3	#2	#1	#0
5005			QNI			PRC		CNI
			QNI					

[Input type] Parameter input
[Data type] Bit path

 # 0 CNI On the offset screen, Y-axis offset screen, and macro screen, the [INP.C] soft key is:
0: Used.
1: Not used. (The [INP.C] soft key is not displayed.)

 # 2 PRC For direct input of a tool offset value or workpiece coordinate system shift amount:
0: The PRC signal is not used.
1: The PRC signal is used.

 # 5 QNI With the tool length measurement function, a tool compensation number is selected by:
0: Operation through the MDI panel by the operator (selection based on cursor operation).
1: Signal input from the PMC.

	#7	#6	#5	#4	#3	#2	#1	#0
5006		TOS			LVC		TGC	GSC
		TOS						

[Input type] Parameter input
[Data type] Bit

 # 0 GSC When the function for direct input of offset value measured B is used, an offset write input signal is input from:
0: Machine side
1: PMC side
When the interlock function for each axis direction is enabled (when bit 3 (DIT) of parameter No. 3003 is set to 0), switching can also be made between input from the machine side and input from PMC side for the interlock function for each axis direction.

 # 1 TGC If a T code is specified in a block where G50, G04, or G10 is specified:
0: No alarm is issued.
1: The alarm (PS0245) is issued.

 # 3 LVC A tool offset (geometry/wear) based on a tool movement and wear offset based on a coordinate shift are:
0: Not canceled by reset.
1: Canceled by reset.

 # 6 TOS Set a tool length compensation operation.
0: Tool length compensation is performed by an axis movement.
1: Tool length compensation is performed by shifting the coordinate system.

	#7	#6	#5	#4	#3	#2	#1	#0
5007	3OF	3OC						
	3OF	3OC	WMC	WMH	WMA	TMA	TC3	TC2

[Input type] Parameter input
[Data type] Bit path

 # 0 TC2
 # 1 TC3 If a tool length compensation value is set by pressing the [MEASURE] or [+MEASURE] soft key in tool length measurement, the tool automatically moves to the tool change position. Specify at which reference position the tool change position is located.

TC3	TC2	Meaning
0	0	The tool change position is at the first reference position.
0	1	The tool change position is at the second reference position.
1	0	The tool change position is at the third reference position.
1	1	The tool change position is at the fourth reference position.

 # 2 TMA
0: Tool length measurement is enabled along the Z-axis only.
1: Tool length measurement is enabled along each axis.

 # 3 WMA
0: Surface-based measurement of a workpiece zero point offset value is enabled along the Z-axis only.
1: Surface-based measurement of a workpiece zero point offset value is enabled along each axis.

 # 4 WMH
0: Hole-based measurement of a workpiece zero point offset value is disabled.
1: Hole-based measurement of a workpiece zero point offset value is enabled.

 # 5 WMC
0: An axis for workpiece zero point offset value measurement is selected by entering an axis name.
1: An axis for workpiece zero point offset value measurement is selected by using the cursor.

This parameter is valid when bit 3 (WMA) of parameter No. 5007 is set to 1.

 # 6 3OC If tool length compensation is not cancelled before three-dimensional coordinate conversion is specified, an alarm is:
0: Not raised.
1: Raised. (alarm PS0049)

 # 7 **3OF** If three-dimensional coordinate conversion is not nested with a command for tool length compensation, or if three-dimensional coordinate conversion is specified during tool length compensation and another command for tool length compensation is specified:

0: No alarm is issued.

1: The alarm (PS0049) is issued.

Example 1) An alarm is raised in the following cases:

```
1) G68 X_ Y_ Z_ I_ J_ K_ R_ ;
     :
   G43 H1 ;
     :
   G69 ;                          ← PS0049 raised
     :
   G49 ;
2) G43 H1 ;
     :
   G68 X_ Y_ Z_ I_ J_ K_ R_ ;
     :
   G49(G43H2,H2 etc.) ;           ← PS0049 raised
     :
   G69 ;
```

Example 2) No alarm is raised in the following cases:

```
3) G68 X_ Y_ Z_ I_ J_ K_ R_ ;
     :
   G43 H1 ;
     :
   G49 ;
     :
   G69 ;
4) G43 H1 ;
     :
   G68 X_ Y_ Z_ I_ J_ K_ R_ ;
     :
   G69 ;
     :
   G49 ;
```

NOTE

A command to cancel tool length compensation (G28, etc.) will not cause an alarm to be raised. If a command like this is specified in the G68 mode, program as indicated in 3) above.

```
G43 H1 ;
  :
G68 X_ Y_ Z_ I_ J_ K_ R_ ;
  :
G28 X_ Y_ Z_ ;               ← Offset is cancelled.
  :                            No alarm is raised.
G69 ;
```

	#7	#6	#5	#4	#3	#2	#1	#0
5008				MCR	CNV		CNC	

[Input type] Parameter input
[Data type] Bit path

 # 1 CNC
 # 3 CNV These bits are used to select an interference check method in the cutter compensation or tool nose radius compensation mode.

CNV	CNC	Operation
0	0	Interference check is enabled. The direction and the angle of an arc are checked.
0	1	Interference check is enabled. Only the angle of an arc is checked.
1	-	Interference check is disabled.

For the operation taken when the interference check shows the occurrence of an reference (overcutting) , see the description of bit 5 (CAV) of parameter No. 19607.

NOTE
Checking of only the direction cannot be set.

 # 4 MCR If G41/G42 (cutter compensation or tool nose radius compensation) is specified in the MDI mode, an alarm is:
0: Not raised.
1: Raised. (alarm PS5257)

	#7	#6	#5	#4	#3	#2	#1	#0
5009								GSC
			TIP					

[Input type] Parameter input
[Data type] Bit path

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 GSC When the function for direct input of offset value measured B is used, an offset write input signal is input from:
0: Machine side
1: PMC side
When the interlock function for each axis direction is enabled (when bit 3 (DIT) of parameter No. 3003 is set to 0), switching can also be made between input from the machine side and input from PMC side for the interlock function for each axis direction.

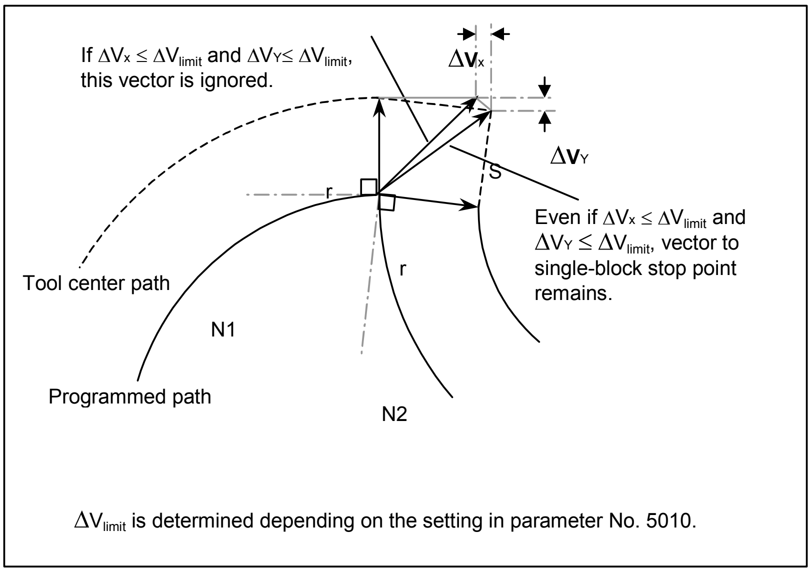
 # 5 TIP In cutter compensation or tool nose radius compensation, the virtual tool tip direction is:
0: Not used.

1: Used.

5010	Limit for ignoring the small movement resulting from cutter compensation or tool nose radius

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

When the tool moves around a corner in cutter compensation or tool nose radius compensation mode, the limit for ignoring the small travel amount resulting from compensation is set. This limit eliminates the interruption of buffering caused by the small travel amount generated at the corner and any change in feedrate due to the interruption.



5011	Constant denominator for three-dimensional tool compensation or tool length compensation in a specified direction

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the value of p in the expressions used for finding a three-dimensional tool compensation vector:

$$Vx = i \times r / p$$
$$Vy = j \times r / p$$
$$Vz = k \times r / p$$

where,

Vx, Vy, Vz : Components of a three-dimensional tool compensation vector along the X-axis, Y-axis, and Z-axis, or their parallel axes
i, j, k : Values specified in addresses I, J, and K in the program
r : Compensation value
p : Value set in this parameter

When 0 is set in this parameter, the following is assumed:

$$p = \sqrt{I^2 + J^2 + K^2}$$

5013	Maximum value of tool wear compensation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (offset unit)
[Minimum unit of data] The increment system of a tool offset value is followed.
[Valid data range] The settings of bits 3 to 0 (OFE, OFD, OFC, and OFA) of parameter No. 5042 are followed.

For metric input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0 to 9999.99mm
0	0	0	0	0 to 9999.999mm
0	0	1	0	0 to 9999.9999mm
0	1	0	0	0 to 9999.99999mm
1	0	0	0	0 to 999.999999mm

For inch input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0 to 999.999inch
0	0	0	0	0 to 999.9999inch
0	0	1	0	0 to 999.99999inch
0	1	0	0	0 to 999.999999inch
1	0	0	0	0 to 99.9999999inch

This parameter sets the maximum allowable tool wear compensation value. If an attempt is made to set a tool wear compensation value, the absolute value of which exceeds the value set in this parameter, the following alarm or warning is output:

Input from MDI	Warning: Too many digits
Input by G10	Alarm PS0032: Offset value is out of range by G10.

When 0 or a negative value is set, no maximum allowable value is applied.

[Example] When 30.000 is set
As a tool offset value, a value from -30.000 to +30.000 can be input.

5014	Maximum value of incremental input for tool wear compensation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (offset unit)
[Minimum unit of data] The increment system of a tool offset value is followed.
[Valid data range] The settings of bits 3 to 0 (OFE, OFD, OFC, and OFA) of parameter No. 5042 are followed.

For metric input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0to9999.99mm
0	0	0	0	0to9999.999mm
0	0	1	0	0to9999.9999mm
0	1	0	0	0to9999.99999mm
1	0	0	0	0to999.999999mm

For inch input

OFE	OFD	OFC	OFA	Valid data range
0	0	0	1	0to999.999inch
0	0	0	0	0to999.9999inch
0	0	1	0	0to999.99999inch
0	1	0	0	0to999.999999inch
1	0	0	0	0to99.9999999inch

Set the maximum allowable value for the tool wear compensation value, input as an incremental value. If the incremental input value (absolute value) exceeds the set value, the following alarm or warning message is output:

Input from MDI	Warning: Too many digits
Input by G10	Alarm PS0032: Offset value is out of range by G10.

When 0 or a negative value is set, no maximum allowable value is applied.

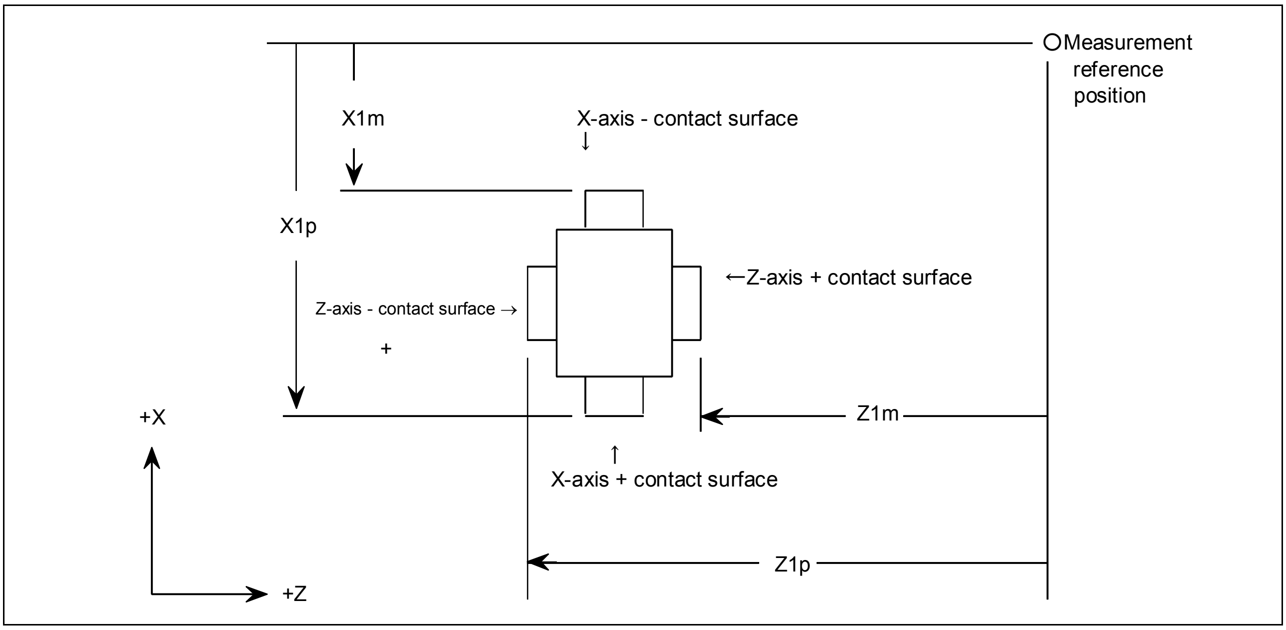
5015	Distance to X-axis + contact surface of touch sensor 1 (X1P)
5016	Distance to X-axis - contact surface of touch sensor 1 (X1M)
5017	Distance to Z-axis + contact surface of touch sensor 1 (Z1P)
5018	Distance to Z-axis - contact surface of touch sensor 1 (Z1M)
5056	Distance to X-axis + contact surface of touch sensor 2 (X2P)
5057	Distance to X-axis - contact surface of touch sensor 2 (X2M)
5058	Distance to Z-axis + contact surface of touch sensor 2 (Z2P)
5059	Distance to Z-axis - contact surface of touch sensor 2 (Z2M)

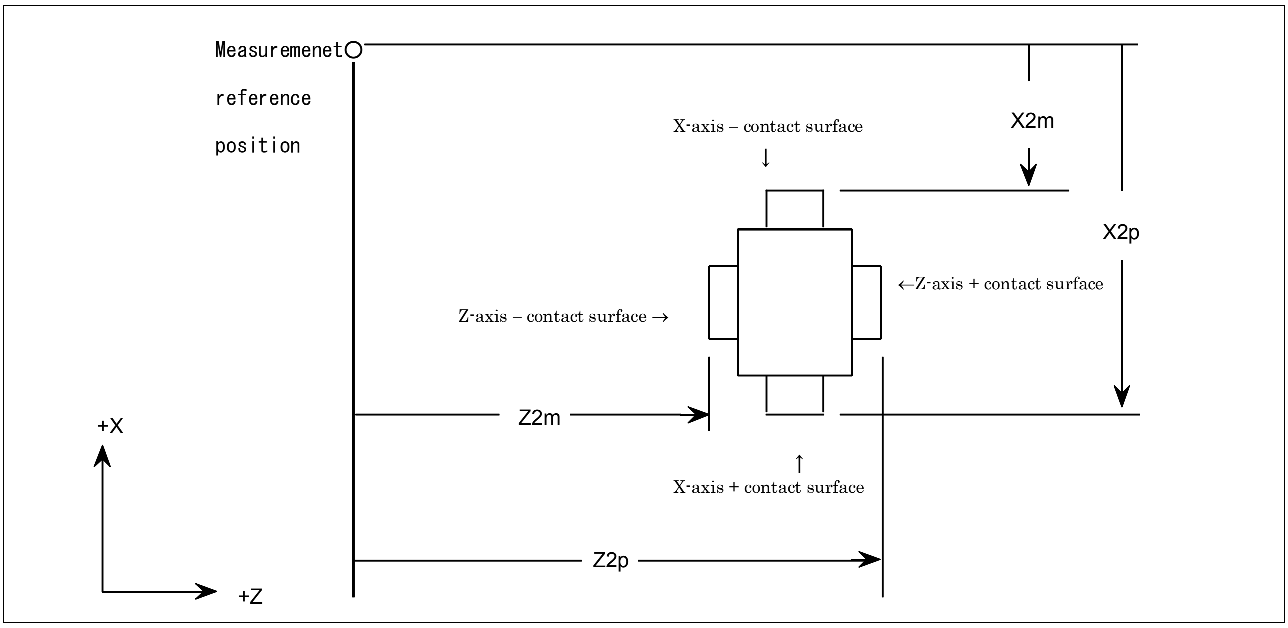
[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))

This parameter is related to the function for direct input of offset value measured B.

Set the distance (signed) from a measurement reference position to each contact surface of a sensor. For a diameter specification axis, set a diameter value.

NOTE
Parameter No. 5056 to No.5059 are valid when bit 0 (2NR) of parameter No. 5051 is set to 1.





5020	Tool offset number used with the function for direct input of offset value measured B

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to number of tool compensation values

Set a tool offset number used with the function for direct input of offset value measured B (when a workpiece coordinate system shift amount is set). (Set the tool offset number corresponding to a tool under measurement beforehand.) This parameter is valid when automatic tool offset number selection is not performed (when bit 5 (QNI) of parameter No. 5005 is set to 0).

5021	Number of interpolation cycles of pulses stored until the tool is about to touch the touch sensor

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 8

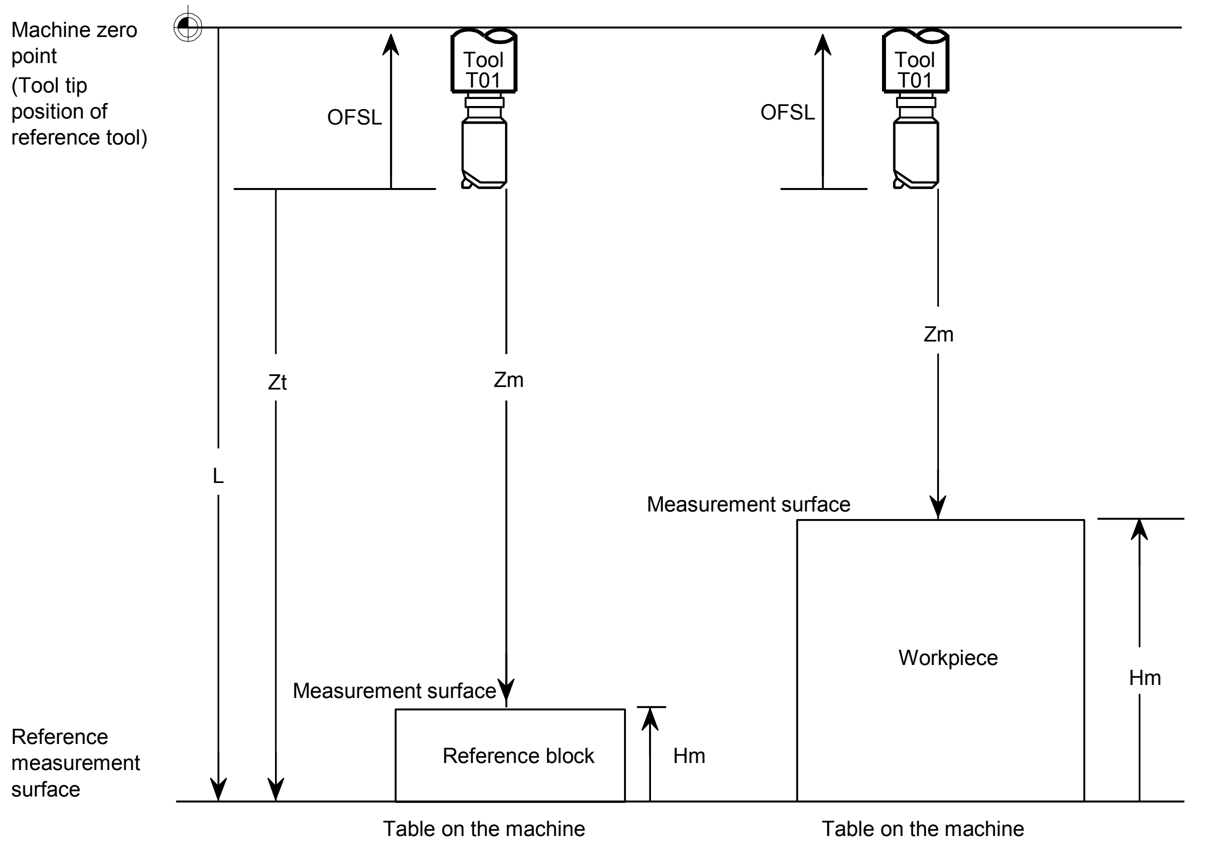
When a touch sensor of one-point input is used with the function for direct input of offset value measured B, set the number of interpolation cycles of pulses stored until the manually operated tool is about to touch the touch sensor. When 0 is set, the specification of the maximum value 8 is assumed.

NOTE
This parameter is valid when bit 3 (TSI) of parameter No. 5004 is set to 1.

5022	Distance (L) from reference tool tip position to the reference measurement surface

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

For each axis, this parameter sets the distance from the reference tool tip position to the reference measurement surface when the machine is at the machine zero point.



L: Distance from the reference tool tip to the reference measurement surface (machine coordinates of the reference measurement surface)
Hm: Distance from the reference measurement surface to actual measurement surface
Zm: Distance from the tool tip of the measured tool at the machine zero point to the measurement surface
Zt: Distance from the tool tip of the measured tool at the machine zero point to the reference measurement surface
OFSL: Tool length compensation (OFSL = Zm-Hm-L)

5024	Number of tool compensation values

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 999

Set the maximum allowable number of tool compensation values used for each path.
Ensure that the total number of values set in parameter No. 5024 for the individual paths is within the number of compensation values usable in the entire system. The number of compensation values usable in the entire system depends on the option configuration.
If the total number of values set in parameter No. 5024 for the individual paths exceeds the number of compensation values usable in the entire system, or 0 is set in parameter No. 5024 for all paths, the number of compensation values usable for each path is a value obtained by dividing the number of compensation values usable in the entire system by the number of paths.
Tool compensation values as many as the number of compensation values used for each path are displayed on the screen. If tool compensation numbers more than the number of compensation values usable for each path are specified, an alarm is issued.
For example, 64 tool compensation sets are used, 20 sets may be allocated to path 1, 30 sets to path 2, and 14 sets to path 3. All of 64 sets need not be used.

5028	Number of digits of an offset number used with a T code command

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 3

Specify the number of digits of a T code portion that is used for a tool offset number (wear offset number when the tool geometry/wear compensation function is used).
When 0 is set, the number of digits is determined by the number of tool compensation values.
When the number of tool compensation values is 1 to 9: Lower 1 digit
When the number of tool compensation values is 10 to 99: Lower 2 digits
When the number of tool compensation values is 100 to 999: Lower 3 digits

Example :

When an offset number is specified using the lower 2 digits of a T code, set 2 in parameter No. 5028.
Txxxxxx yy
xxxxxx : Tool selection

yy : Tool offset number

> **NOTE**
> A value longer than the setting of parameter No. 3032 (allowable number of digits of a T code) cannot be set.

5029	Number of tool compensation value memories common to paths

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 999

When using memories common to paths, set the number of common tool compensation values in this parameter.
Ensure that the setting of this parameter does not exceed the number of tool compensation values set for each path (parameter No. 5024).

[Example 1]
When parameter No. 5029 = 10, parameter No. 5024 (path 1) = 15, and parameter No. 5024 (path 2) = 30 in a 2-path system, tool compensation numbers 1 to 10 of all paths are made common.

[Example 2]
When parameter No. 5029 = 20 and the other conditions are the same as for Example 1, tool compensation numbers 1 to 15 are made common.

> **NOTE**
> 1 When a multi-path system involving the machining center system and lathe system is used, memories are made common in each system.
> 2 In each of the machining center system and lathe system, the same unit of tool compensation values needs to be used.
> 3 Ensure that the setting of parameter No. 5029 does not exceed the number of tool compensation values for each path (parameter No. 5024). If the setting of parameter No. 5029 exceeds the number of compensation values of a path, the least of the numbers of compensation values in all paths is made common.
> 4 When 0 or a negative value is set, memories common to paths are not used.

	#7	#6	#5	#4	#3	#2	#1	#0
5040				TLG	TCT	MOF		OWD
						MOF		

[Input type] Parameter input
[Data type] Bit path

 # 0 OWD In radius programming (bit 1 (ORC) of parameter No. 5004 is set to 1),
0: Tool offset values of both geometry compensation and wear compensation are specified by radius.
1: Tool offset value of geometry compensation is specified by radius and tool offset value of wear compensation is specified by diameter, for an axis of diameter programming.

> **NOTE**
> This parameter is valid when the option for tool geometry compensation or tool wear compensation is specified.

 # 2 MOF The DI/DO signals used with the active offset value modification mode based on manual feed are:
0: G297#4, G297#5, G297#6, and F297#5
1: G203#4, G203#5, G203#6, and F199#5

 # 3 TCT The tool change method is based on:
0: Turret rotation. (Tool change operation is performed with a T command only.)
With a T command, an auxiliary function and tool offset operation are performed.
1: Automatic tool changer (ATC).
(Tool change operation is performed with an M command (such as M06)).
With a T command, an auxiliary function only is performed.
This parameter is valid with the T series only.

 # 4 TLG When tool change operation is performed with the automatic tool changer (when bit 3 (TCT) of parameter No. 5040 is set to 1), tool offset operation is specified by:
0: G43.7.
At this time, G43 and G44 function as G codes for tool length compensation.
1: G43.
At this time, G43.7 and G44.7 function as G codes for tool length compensation.

	#7	#6	#5	#4	#3	#2	#1	#0
5041		AON					ATP	ACR
		AON						ACR

[Input type] Parameter input
[Data type] Bit path

 # 0 ACR When the active offset value modification mode based on manual feed is selected in the reset state or cleared state, the tool compensation value is:
0: Changeable.
1: Not changeable.
* For the M series
In the cleared state (when bit 6 (CLR) of parameter No. 3402 is set to 1), the tool compensation value changeability depends on the setting of bit 7 (CFH) of parameter No. 3409 as indicated below.

	Parameter ACR=0	Parameter ACR=1
Parameter CFH=0	No changeable	Not changeable
Parameter CFH=1	Changeable	Not changeable

* For the T series
The tool compensation value changeability depends on the settings of this parameter, bit 3 (LVC) of parameter No. 5006, and bit 7 (TGC) of parameter No. 5003 as indicated below.

	Parameter ACR=0	Parameter ACR=1
Parameter LVC=0	Changeable	Not changeable
Parameter LVC=1	Not changeable	
Parameter TGC=0	Changeable	
Parameter TGC=1	Not changeable	

 # 1 ATP

0: By moving the tool along the X-axis, Z-axis, and Y-axis, the compensation value for each axis can be changed.

Move axis	Selected offset value	State display
X-axis	X-axis compensation value	TOFS
Z-axis	Z-axis compensation value	TOFS
Y-axis	Y-axis compensation value	TOFS

1: By moving the tool along an arbitrary axis (other than rotation axes), the compensation value can be changed according to the selection of the output signals AOFS1 and AOFS2 (Gn297#5,#6).

Output signal		Selected offset value	State display
AOFS2	AOFS1		
0	0	X-axis compensation value	OFSX
0	1	Z-axis compensation value	OFSZ
1	1	Y-axis compensation value	OFSY

> **NOTE**
> Do not change the setting of this parameter in the active offset value modification mode.

 # 6 AON If a change is made to a tool compensation value (tool length compensation value used with tool length compensation A/B in the case of the M series):

0: In the case of the M series, the change becomes effective starting with the next block specifying G43, G44, or an H code.
In the case of the T series, the change becomes effective starting with the next block specifying a T code.

1: The change becomes effective starting with the next block to be buffered.

> **NOTE**
> 1 This parameter is valid when bit 6 (EVO) of parameter No. 5001 is set to 0.
> 2 The operation of this parameter set to 1 is valid even if a new compensation value is further changed by MDI input or a G10 command before the new compensation value becomes effective.
> 3 The operation of this parameter set to 1 is invalid if a reset operation is performed before a new compensation value becomes effective.

	#7	#6	#5	#4	#3	#2	#1	#0
5042					OFE	OFD	OFC	OFA

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 OFA
 # 1 OFC
 # 2 OFD
 # 3 OFE These bits are used to specify the increment system and valid data range of a tool offset value.

For metric input

OFE	OFD	OFC	OFA	Unit	Valid data range
0	0	0	1	0.01mm	±9999.99mm
0	0	0	0	0.001mm	±9999.999mm
0	0	1	0	0.0001mm	±9999.9999mm
0	1	0	0	0.00001mm	±9999.99999mm
1	0	0	0	0.000001mm	±999.999999mm

For inch input

OFE	OFD	OFC	OFA	Unit	Valid data range
0	0	0	1	0.001inch	±999.999inch
0	0	0	0	0.0001inch	±999.9999inch
0	0	1	0	0.00001inch	±999.99999inch
0	1	0	0	0.000001inch	±999.999999inch
1	0	0	0	0.0000001inch	±99.9999999inch

	#7	#6	#5	#4	#3	#2	#1	#0
5051							2AT	2NR

[Input type] Parameter input
[Data type] Bit path

 # 0 2NR When the tool setter function for one-turret/two-spindle lathes is used:
0: One touch sensor is used.
1: Two touch sensors are used.

 # 1 2AT When a workpiece coordinate system shift amount is set in the workpiece coordinate system memory with the tool setter function for one-turret/two-spindle lathes:
0: A setting is made at the current cursor position.
1: An automatic selection is made.

5053	Tool compensation number shift amount for the one-turret/two-spindle tool setter function

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to number of tool compensation values

When the tool setter function for one-turret/two-spindle lathes is used, tool compensation numbers used to set measured tool compensation values are divided into two groups, one for spindle 1 and the other for spindle 2.

(Example) When there are 32 tool offset pairs

	Setting	
	8	10
Spindle 1	1 to 8	1 to 10
Spindle 2	9 to 32	11 to 32

When this parameter is set to 0 or a value greater than the maximum number of tool offset pairs, the table below is applied.

Number of tool offset pairs	32 pairs	64 pairs	99 pairs	200 pairs	400 pairs	499 pairs	999 pairs
Spindle 1	1 to 16	1 to 32	1 to 49	1 to 100	1 to 200	1 to 249	1 to 499
Spindle 2	17 to 32	33 to 64	50 to 98	101 to 200	201 to 400	250 to 498	500 to 998

5054	Workpiece coordinate system memory for spindle 1

5055	Workpiece coordinate system memory for spindle 2

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 54 to 59

Specify a workpiece coordinate system from G54 to G59 for which a workpiece coordinate system shift amount is set. When parameter no. 5054 or No. 5055 is set to 0 or a value beyond the valid data range, the specification of 54 is assumed for the workpiece coordinate system memory for spindle 1, or the specification of 57 is assumed for the workpiece coordinate system memory for spindle 2.

NOTE

These parameters are valid when bit 1 (2AT) of parameter No. 5051 is set to 1.

4.21 PARAMETERS OF CANNED CYCLES

4.21.1 Parameter of Canned Cycle for Drilling (1 of 2)

	#7	#6	#5	#4	#3	#2	#1	#0
5101						RTR	EXC	FXY
	M5B						EXC	FXY

[Input type] Parameter input
[Data type] Bit path

 # 0 FXY The drilling axis in the drilling canned cycle is:
0: Always the Z-axis
1: The axis selected by the program

> **NOTE**
> In the case of the T series, this parameter is valid only for the drilling canned cycle in the Series 15 format.

 # 1 EXC G81
0: Specifies a drilling canned cycle
1: Specifies an external operation command

 # 2 RTR G83 and G87
0: Specify a high-speed peck drilling cycle
1: Specify a peck drilling cycle

 # 7 M5B In drilling canned cycles G76 and G87:
0: Outputs M05 before an oriented spindle stops
1: Not output M05 before an oriented spindle stops

	#7	#6	#5	#4	#3	#2	#1	#0
5102	RDI	RAB			F16	QSR		

[Input type] Parameter input
[Data type] Bit path

 # 2 QSR Before a multiple repetitive turning canned cycle (G70 to G73) is started, a check to see if the program contains a block that has the sequence number specified in address Q is:
0: Not made.
1: Made.
When 1 is set in this parameter and the sequence number specified in address Q is not found, the alarm (PS0063) is issued and the canned cycle is not executed.

 # 3 F16 When the Series 15 format is used (with bit 1 (FCV) of parameter No.0001 set to 1), a canned drilling cycle is specified using :
0: Series 15 format
1: Series 16 format. However, the number of repetitions is specified using address L.

 # 6 RAB When a canned drilling cycle using the Series 15 format is specified (with bit 1 (FCV) of parameter No. 0001 set to 1 and bit 3 (F16) of parameter No. 5102 set to 0), address R specifies:
0: Increment command.
1: Absolute command with G code system A. With G code system B or C, G90 and G91 are followed.

 # 7 RDI When a canned drilling cycle using the Series 15 format is specified (with bit 1 (FCV) of parameter No. 0001 set to 1 and bit 3 (F16) of parameter No. 5102 set to 0), address R is based on:
0: Radius specification.
1: Diameter/radius specification of the drilling axis.

	#7	#6	#5	#4	#3	#2	#1	#0
5103		TCZ			PNA	DCY		
		TCZ				DCY		SIJ

[Input type] Parameter input
[Data type] Bit path

 # 0 SIJ When the FS15 program format is used, a tool shift value for the drilling canned cycle G76 or G87 is specified by:
0: Address Q. Set a tool retraction direction in parameter No. 5148.
1: Address I, J, or K.

 # 2 DCY When an axis (to be used as a drilling axis) perpendicular to the positioning plane is specified in a drilling canned cycle:
0: The specified axis is used as a drilling axis.
1: The axis specified in the block where the G code for the drilling canned cycle is specified is used as a drilling axis. The specified axis is used as a positioning axis.

NOTE
This parameter is valid when bit 0 (FXY) of parameter No. 5101 is set to 1.

 # 3 PNA In a drilling canned cycle using the Series 15 format (with bit 1 (FCV) of parameter No. 0001 set to 1 and bit 3 (F16) of parameter No. 5102 set to 0), when a plane where no axis is present is specified in the drilling canned cycle mode:
0: An alarm is issued.
1: No alarm is issued.

 # 6 TCZ In a tapping cycle (excluding rigid tapping), an accumulated zero check in the tapping step (forward, backward) is:

0: Not performed.

1: Performed.

Execute a tapping cycle (excluding rigid tapping) with the servo feed forward (bit 1 (FEED) of parameter No. 2005). If an impact is detected, set this parameter to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
5104						FCK		

[Input type] Parameter input
[Data type] Bit path

 # 2 FCK In a multiple repetitive turning canned cycle (G71/G72), the machining profile is:

0: Not checked.

1: Checked.

The target figure specified by G71 or G72 is checked for the following before machining operation:

- If the start point of the canned cycle is less than the maximum value of the machining profile even when the plus sign is specified for a finishing allowance, the alarm (PS0322) is issued.
- If the start point of the canned cycle is greater than the minimum value of the machining profile even when the minus sign is specified for a finishing allowance, the alarm (PS0322) is issued.
- If an unmonotonous command of type I is specified for the axis in the cutting direction, the alarm (PS0064 or PS0329) is issued.
- If an unmonotonous command is specified for the axis in the roughing direction, the alarm (PS0064 or PS0329) is issued.
- If the program does not include a block that has a sequence number specified by address Q, the alarm (PS0063) is issued. This check is made, regardless of bit 2 (QSR) of parameter No. 5102.
- If a command (G41/G42) on the blank side in tool nose radius compensation is inadequate, the alarm (PS0328) is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
5105				K0D	M5T	RF2	RF1	SBC
					M5T			SBC

[Input type] Parameter input
[Data type] Bit path

 # 0 SBC In a drilling canned cycle, chamfer cycle, or corner rounding cycle:
0: A single block stop is not performed.
1: A single block stop is performed.

 # 1 RF1 In a multiple repetitive turning canned cycle (G71/G72) of type I, roughing is:
0: Performed.
1: Not performed.

> **NOTE**
> When a roughing allowance (Δi/Δk) is specified using the Series 15 program format, roughing is performed, regardless of the setting of this parameter.

 # 2 RF2 In a multiple repetitive turning canned cycle (G71/G72) of type II, roughing is:
0: Performed.
1: Not performed.

> **NOTE**
> When a roughing allowance (Δi/Δk) is specified using the Series 15 program format, roughing is performed, regardless of the setting of this parameter.

 # 3 M5T When the rotation direction of the spindle is changed from forward rotation to reverse rotation or from reserve rotation to forward rotation in a tapping cycle (G84/G88 with the T series, or G84/G74 with the M series):
0: M05 is output before output of M04 or M03.
1: M05 is not output before output of M04 or M03.

 # 4 K0D When K0 is specified in a drilling canned cycle (G80 to G89):
0: Drilling operation is not performed, but drilling data only is stored.
1: One drilling operation is performed.

5110	M code for C-axis clamping in a drilling canned cycle

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999998

This parameter sets an M code for C-axis clamping in a drilling canned cycle.

5111	Dwell time when C-axis unclamping is specified in drilling canned cycle

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 32767
[Unit of data]

Increment system	IS-A	IS-B	IS-C	IS-D	IS-E	Unit
	10	1	0.1	0.01	0.001	msec

(The increment system does not depend on whether inch input or metric input is used.)

This parameter sets the dwell time when C-axis unclamping is specified in a drilling canned cycle.

5112	Spindle forward-rotation M code in drilling canned cycle

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the spindle forward-rotation M code in a drilling canned cycle.

NOTE
M03 is output when "0" is set.

5113	Spindle reverse-rotation M code in drilling canned cycle

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the spindle reverse-rotation M code in a drilling canned cycle.

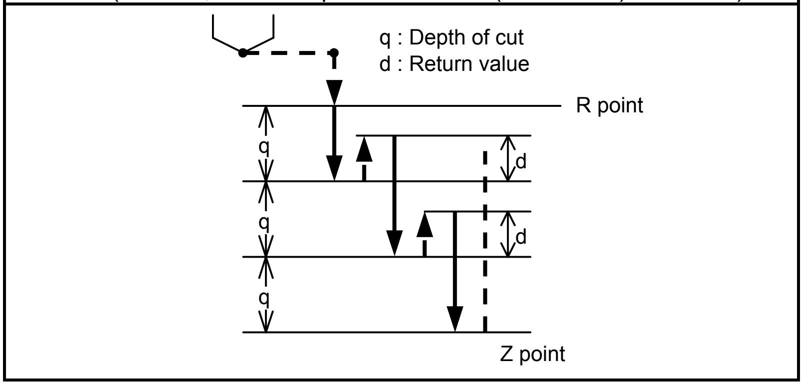
NOTE
M04 is output when "0" is set.

5114	Return value of high-speed peck drilling cycle

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the return value in high-speed peck drilling cycle.

G73 (M series)
G83 (T series, when the parameter RTR (No.5101#2) is set to 0)

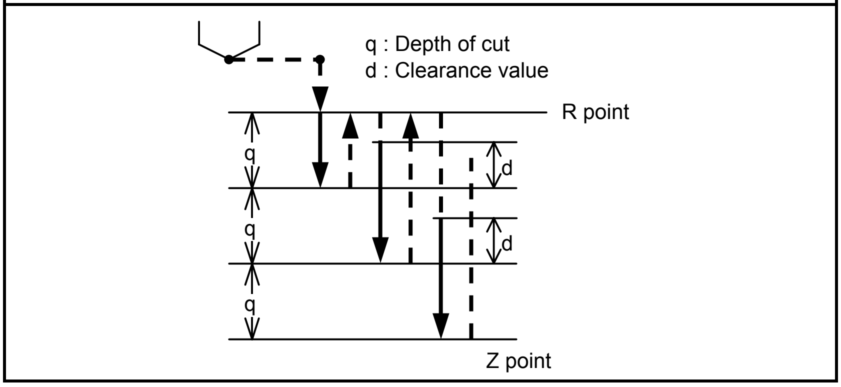


5115	Clearance value in a peck drilling cycle

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a clearance value in a peck drilling cycle.

G83 (M series)
G83 (T series, when the parameter RTR (No.5101#2) is set to 1)



4.21.2 Parameter of Thread Cutting Cycle

5130	Cutting value (chamfering value) in thread cutting cycles G92 and G76

[Input type] Parameter input
[Data type] Byte path
[Unit of data] 0.1
[Valid data range] 0 to 127

This parameter sets a cutting value (chamfering value) in the thread cutting cycle (G76) of a multiple repetitive turning canned cycle and in the thread cutting cycle (G92) of a canned cycle.
Let L b a lead. Then, a cutting value range from 0.1L to 12.7L is allowed.
To specify a cutting value of 10.0L, for example, specify 100 in this parameter.

5131	Cutting angle in thread cutting cycles G92 and G76

[Input type] Parameter input
[Data type] Byte path
[Unit of data] Degree
[Valid data range] 1 to 89

This parameter sets a thread cutting angle in a thread cutting cycle (G92/G76).
When 0 is set, an angle of 45 degrees is specified.

4.21.3 Parameter of Multiple Repetitive Canned Cycle

5132	Depth of cut in multiple repetitive turning canned cycles G71 and G72

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the depth of cut in multiple repetitive turning canned cycles G71 and G72.
This parameter is not used with the Series 15 program format.

NOTE
Specify a radius value at all times.

5133	Escape in multiple repetitive turning canned cycles G71 and G72

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the escape in multiple repetitive turning canned cycle G71 and G72.

NOTE
Specify a radius value at all times.

5134	Clearance value in multiple repetitive turning canned cycles G71 and G72

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets a clearance value up to the cutting feed start point in a multiple repetitive turning canned cycle (G71/G72).

> **NOTE**
> Specify a radius value at all times.

5135	Retraction distance in the multiple repetitive turning canned cycle G73 (second axis on the plane)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a retraction distance along the second axis on the plane in the multiple repetitive turning canned cycle G73. This parameter is not used with the Series 15 program format.

> **NOTE**
> Specify a radius value at all times.

5136	Retraction distance in the multiple repetitive turning canned cycle G73 (first axis on the plane)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets a retraction distance along the first axis on the plane in the multiple repetitive turning canned cycle G73. This parameter is not used with the Series 15 program format.

NOTE
Specify a radius value at all times.

5137	Number of divisions in the multiple repetitive turning canned cycle G73

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Cycle
[Valid data range] 1 to 99999999
This parameter sets the number of divisions in the multiple repetitive turning canned cycle G73.
This parameter is not used with the Series 15 program format.

5139	Return in multiple repetitive turning canned cycles G74 and G75

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)
This parameter sets the return in multiple repetitive turning canned cycles G74 and G75.

NOTE
Specify a radius value at all times.

5140	Minimum depth of cut in the multiple repetitive turning canned cycle G76

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets a minimum depth of cut in the multiple repetitive turning canned cycle G76 so that the depth of cut does not become too small when the depth of cut is constant.

> **NOTE**
> Specify a radius value at all times.

5141	Finishing allowance in the multiple repetitive turning canned cycle G76

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the finishing allowance in multiple repetitive turning canned cycle G76.

> **NOTE**
> Specify a radius value at all times.

5142	Repetition count of final finishing in multiple repetitive turning canned cycle G76

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Cycle
[Valid data range] 1 to 99999999

This parameter sets the number of final finishing cycle repeats in the multiple repetitive turning canned cycle G76.
When 0 is set, only one final finishing cycle is executed.

5143	Tool nose angle in multiple repetitive turning canned cycle G76

[Input type] Parameter input
[Data type] Byte path
[Unit of data] Degree
[Valid data range] 0, 29, 30, 55, 60, 80

This parameter sets the tool nose angle in multiple repetitive turning canned cycle G76.
This parameter is not used with the Series 15 program format.

5145	Allowable value 1 in multiple repetitive turning canned cycles G71 and G72

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

If a monotonous command of type I or II is not specified for the axis in the roughing direction, the alarm (PS0064 or PS0329) is issued. When a program is created automatically, a very small unmonotonous figure may be produced. Set an unsigned allowable value for such an unmonotonous figure. By doing so, G71 and G72 cycles can be executed even in a program including an unmonotonous figure.
Example)
Suppose that a G71 command where the direction of the cutting axis (X-axis) is minus and the direction of the roughing axis (Z-axis) is minus is specified. In such a case, when an unmonotonous command for moving 0.001 mm in the plus direction along the Z-axis is specified in a target figure program, roughing can be performed according to the programmed figure without an alarm by setting 0.001 mm in this parameter.

NOTE

A check for a monotonous figure is made at all times during G71 and G72 cycles. A figure (programmed path) is checked. When tool nose radius compensation is performed, a path after compensation is checked. When bit 2 (FCK) of parameter No. 5104 is set to 1, a check is made before G71 G72 cycle operation. In this case, not a path after tool nose radius compensation but a programmed path is checked.
Note that no alarm is issued when an allowable value is set.
Use a radius value to set this parameter at all times.

5146	Allowable value 2 in multiple repetitive turning canned cycles G71 and G72

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to cut of depth

If a monotonous command of type I is not specified for the axis in the cutting direction, the alarm (PS0064 or PS0329) is issued. When a program is created automatically, a very small unmonotonous figure may be produced. Set an unsigned allowable value for such an unmonotonous figure. By doing so, G71 and G72 cycles can be executed even in a program including an unmonotonous figure.
The allowable value is clamped to the depth of cut specified by a multiple repetitive turning canned cycle.
Example)

Suppose that a G71 command where the direction of the cutting axis (X-axis) is minus and the direction of the roughing axis (Z-axis) is minus is specified. In such a case, when an unmonotonous command for moving 0.001 mm in the minus direction along the X-axis is specified in a target figure program for moving from the bottom of cutting to the end point, roughing can be performed according to the programmed figure without an alarm by setting 0.001 mm in this parameter.

NOTE

A check for a monotonous figure is made at all times during G71 and G72 cycles. A figure (programmed path) is checked. When tool nose radius compensation is performed, a path after compensation is checked. When bit 2 (FCK) of parameter No. 5104 is set to 1, a check is made before G71 G72 cycle operation. In this case, not a path after tool nose radius compensation but a programmed path is checked.
Note that no alarm is issued when an allowable value is set.
Use a radius value to set this parameter at all times.

4.21.4 Parameter of Canned Cycle for Drilling (2 of 2)

5148	Tool retraction direction after orientation in a fine boring cycle or back boring cycle

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] -20 to 20

This parameter sets an axis and direction for tool retraction after spindle orientation in a fine boring cycle or back boring cycle. For each boring axis, an axis and direction for tool retraction after orientation can be set. Set a signed axis number.

Example)
Suppose that:
When the boring axis is the X-axis, the tool retraction direction after orientation is -Y.
When the boring axis is the Y-axis, the tool retraction direction after orientation is +Z.
When the boring axis is the Z-axis, the tool retraction direction after orientation is -X.
Then, set the following (assuming that the first, second, and third axes are the X-axis, Y-axis, and Z-axis, respectively):
Set -2 in the parameter for the first axis. (The tool retraction direction is -Y.)
Set 3 in the parameter for the second axis. (The tool retraction direction is -Y.)
Set -1 in the parameter for the third axis. (The tool retraction direction is -X.)
Set 0 for other axes.

5149	Override for retraction in a boring cycle (G85/G89)

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 0 to 2000

This parameter sets an override value for the feedrate of retraction in a boring cycle. The cutting feedrate override signal and the second feedrate override signal are valid, regardless of the setting of this parameter. The setting of this parameter is valid even when the override cancel signal is set to 1.
When 0 is set in this parameter, the following operation is performed:
For the T series
Operation performed when 200 is set in this parameter (The retraction feedrate is two times greater than the cutting feedrate.)
For the M series
Operation performed when 100 is set in this parameter (The retraction feedrate is the cutting feedrate.)

	#7	#6	#5	#4	#3	#2	#1	#0
5160					CYM			
					CYM	NOL	OLS	

[Input type] Parameter input
[Data type] Bit path

#1 OLS When an overload torque detection signal is received in a peck drilling cycle of a small diameter, the feedrate and spindle speed are:
0: Not changed.
1: Changed.

#2 NOL When the depth of cut per action is satisfied although no overload torque detection signal is received in a peck drilling cycle of a small diameter, the feedrate and spindle speed are:
0: Not changed.
1: Changed.

 # 3 CYM When a subprogram call is specified in a block specifying other commands in the canned cycle mode:
0: No alarm is issued. (When a command of address P is specified, the command is handled as both a command specifying a dwell time and a command specifying a subprogram number in a canned cycle.)
1: An alarm is issued.

5163	M code that specifies the peck drilling cycle mode of a small diameter

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 99999999
This parameter sets an M code that specifies the peck drilling cycle mode of a small diameter.

5164	Percentage of the spindle speed to be changed at the start of the next advancing after an overload torque detection signal is received

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the spindle speed to be changed at the start of the next advancing after the tool is retracted because the overload torque detection signal is received.

$S2 = S1 \times d1 \div 100$

S1: Spindle speed to be changed
S2: Spindle speed changed

Set d1 as a percentage.

> **NOTE**
> When 0 is set, the spindle speed is not changed.

5165	Percentage of the spindle speed to be changed at the start of the next advancing when no overload torque detection signal is received

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the spindle speed to be changed at the start of the next advancing after the tool is retracted without the overload torque detection signal received.

$S2 = S1 \times d2 \div 100$

S1: Spindle speed to be changed
S2: Spindle speed changed

Set d2 as a percentage.

> **NOTE**
> When 0 is set, the spindle speed is not changed.

5166	Percentage of the cutting feedrate to be changed at the start of the next cutting after an overload torque detection signal is received

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the cutting feedrate to be changed at the start of cutting after the tool is retracted and advances because the overload torque detection signal is received.

F2 = F1 × b1 ÷ 100
F1: Cutting feedrate to be changed
F2: Cutting feedrate changed

Set b1 as a percentage.

NOTE
When 0 is set, the cutting feedrate is not changed.

5167	Percentage of the cutting feedrate to be changed at the start of the next cutting when no ovarload torque detection signal is received

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the percentage of the cutting feedrate to be changed at the start of cutting after the tool is retracted and advances without the overload torque detection signal received.

F2 = F1 × b2 ÷ 100
F1: Cutting feedrate to be changed
F2: Cutting feedrate changed

Set b2 as a percentage.

NOTE
When 0 is set, the cutting feedrate is not changed.

5168	Lower limit of the percentage of the cutting feedrate in a peck drilling cycle of a small diameter

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 1 to 255

This parameter sets the lower limit of the percentage of the cutting feedrate changed repeatedly to the specified cutting feedrate.

$FL = F \times b3 \div 100$

F: Specified cutting feedrate
FL: Changed cutting feedrate

Set b3 as a percentage.

5170	Number of the macro variable to which to output the total number of retractions during cutting

[Input type] Parameter input
[Data type] Word path
[Valid data range] 100 to 149

This parameter sets the number of the custom macro common variable to which to output the total number of times the tool is retracted during cutting. The total number cannot be output to common variables #500 to #599.

5171	Number of the macro variable to which to output the total number of retractions because of the reception of an overload torque detection signal

[Input type] Parameter input
[Data type] Word path
[Valid data range] 100 to 149

This parameter sets the number of the custom macro common variable to which to output the total number of times the tool is retracted after the overload torque detection signal is received during cutting. The total number cannot be output to common variables #500 to #599.

5172	Feedrate of retraction to point R when no address I is specified

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets the feedrate of retraction to point R when no address I is specified.

5173	Feedrate of advancing to the position just before the bottom of a hole when no address I is specified

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets the feedrate of advancing to the position just before the bottom of a previously machined hole when no address I is specified.

5174	Clearance in a peck drilling cycle of a small diameter

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the clearance in a peck drilling cycle of a small diameter.

4.22 PARAMETERS OF RIGID TAPPING

	#7	#6	#5	#4	#3	#2	#1	#0
5200	SRS	FHD	PCP	DOV	SIG	CRG		G84
		FHD	PCP	DOV	SIG	CRG		G84

[Input type] Parameter input
[Data type] Bit path

 # 0 G84 Method for specifying rigid tapping
0: An M code specifying the rigid tapping mode is specified prior to the issue of the G84 (or G74) command. (See parameter No.5210).
1: An M code specifying the rigid tapping mode is not used. (G84 cannot be used as a G code for the tapping cycle; G74 cannot be used for the reverse tapping cycle.)

 # 2 CRG Rigid mode when a rigid mode cancel command is specified (G80, G01 group G code, reset, etc.)
0: Canceled after rigid tapping signal RGTAP is set to "0".
1: Canceled before rigid tapping signal RGTAP is set to "0".

 # 3 SIG When gears are changed for rigid tapping, the use of SINDs is
0: Not permitted.
1: Permitted.

 # 4 DOV Override during extraction in rigid tapping
0: Invalidated
1: Validated (The override value is set in parameter No.5211. However, set an override value for rigid tapping return in parameter No. 5381.)

 # 5 PCP Rigid tapping
0: Used as a high-speed peck tapping cycle
1: Not used as a high-speed peck tapping cycle

 # 6 FHD Feed hold and single block in rigid tapping
0: Invalidated
1: Validated

 # 7 SRS To select a spindle used for rigid tapping in multi-spindle control:
0: The spindle selection signals SWS1, SWS2, SWS3, and SWS4 are used. (These signals are used also for multi-spindle control.)
1: The rigid tapping spindle selection signals RGTSP1, RGTSP2, RGTSP3, and RGTSP4 are used. (These signals are provided expressly for rigid tapping.)

	#7	#6	#5	#4	#3	#2	#1	#0
5201				OV3	OVU	TDR		

[Input type] Parameter input
[Data type] Bit path

 # 2 TDR Cutting time constant in rigid tapping
0: Uses a same parameter during cutting and extraction (Parameter Nos. 5261 through 5264)
1: Not use a same parameter during cutting and extraction
Parameter Nos. 5261 to 5264: Time constant during cutting
Parameter Nos. 5271 to 5274: Time constant during extraction

 # 3 OVU The increment unit of the override parameter (No.5211) for tool rigid tapping extraction is:
0: 1%
1: 10%

 # 4 OV3 A spindle speed for extraction is programmed, so override for extraction operation is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
5202				IRR	CHR			ORI

[Input type] Parameter input
[Data type] Bit path

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 ORI When rigid tapping is started:
0: Spindle orientation is not performed.
1: Spindle orientation is performed.
This parameter can be used only for a serial spindle.
This spindle orientation performs reference position return in the serial spindle/servo mode. The stop position can be changed using the serial spindle parameter No. 4073.

 # 3 CHR When the option for interpolation type rigid tapping is available:
0: Interpolation type rigid tapping is selected.
1: Conventional rigid tapping is selected.
This parameter is valid when the option for interpolation type rigid tapping is available. When the option for interpolation type rigid tapping is not available, conventional rigid tapping is selected, regardless of the setting of this parameter.

 # 4 IRR As the in-position width at point R after movement from point I to point R in rigid tapping:

0: The in-position widths dedicated to rigid tapping (parameters Nos. 5300, 5302, 5304, and 5306) are selected.
1: The normal in-position width (parameter No. 1826) is selected.

	#7	#6	#5	#4	#3	#2	#1	#0
5203			RBL	OVS		RFF	HRM	HRG

[Input type] Parameter input
[Data type] Bit path

 # 0 HRG Rigid tapping by the manual handle is:
0: Disabled.
1: Enabled.

 # 1 HRM When the tapping axis moves in the negative direction during rigid tapping controlled by the manual handle, the direction in which the spindle rotates is determined as follows:
0: In G84 mode, the spindle rotates in a normal direction. In G74 mode, the spindle rotates in reverse.
1: In G84 mode, the spindle rotates in reverse. In G74 mode, the spindle rotates in a normal direction.

 # 2 RFF In rigid tapping, feed forward is:
0: Disabled.
1: Enabled.

 # 4 OVS In rigid tapping, override by the feedrate override select signal and cancellation of override by the override cancel signal is:
0: Disabled.
1: Enabled.
When feedrate override is enabled, extraction override is disabled.
The spindle override is clamped to 100% during rigid tapping, regardless of the setting of this parameter.

 # 5 RBL As acceleration/deceleration for rigid tapping cutting feed:
0: Linear acceleration/deceleration is used.
1: Bell-shaped acceleration/deceleration is used.

5210	Rigid tapping mode specification M code

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 65535
This parameter sets an M code that specifies the rigid tapping mode.
The M code is judged to be 29 (M29) when "0" is set.

5211	Override value during rigid tapping extraction

[Input type] Parameter input
[Data type] Word path
[Unit of data] 1% or 10%
[Valid data range] 0 to 200

The parameter sets the override value during rigid tapping extraction.

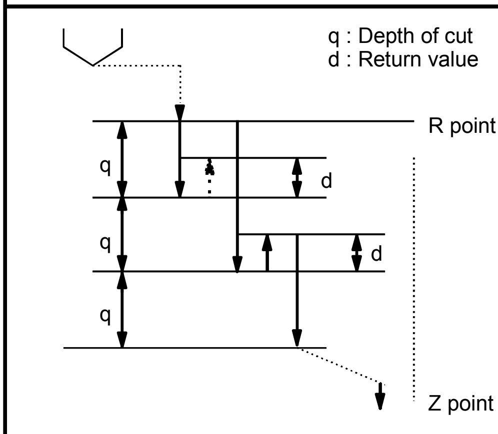
> **NOTE**
> The override value is valid when DOV in parameter No.5200 #4 is "1". When OVU (bit 3 of parameter No.5201) is 1, the unit of set data is 10%. An override of up to 200% can be applied to extraction.

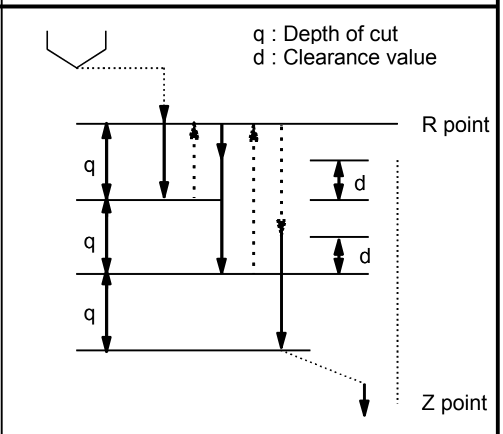
5213	Return in peck rigid tapping cycle

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the drilling axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the return or clearance in the peck tapping cycle.

When the parameter PCP (bit 5 of No.5200) is set to 0.	When the parameter PCP (bit 5 of No.5200) is set to 1.





5214	Setting of an allowable rigid tapping synchronization error range

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets an allowable synchronization error range in rigid tapping.
If a synchronous error range exceeding the setting of this parameter is detected, the alarm (SP0741) is issued. When 0 is set in this parameter, no synchronization error check is made.

5221	Number of gear teeth on the spindle side in rigid tapping (first gear)

5222	Number of gear teeth on the spindle side in rigid tapping (second gear)

5223	Number of gear teeth on the spindle side in rigid tapping (third gear)

5224	Number of gear teeth on the spindle side in rigid tapping (fourth gear)

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 1 to 32767

Each of these parameters is used to set the number of gear teeth on the spindle side for each gear in rigid tapping.

NOTE
When a position coder is attached to the spindle, set the same value for all of parameters No.5221 through No.5224.

5231	Number of gear teeth on the position coder side in rigid tapping (first gear)
5232	Number of gear teeth on the position coder side in rigid tapping (second gear)
5233	Number of gear teeth on the position coder side in rigid tapping (third gear)
5234	Number of gear teeth on the position coder side in rigid tapping (fourth gear)

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 1 to 32767

Each of these parameters is used to set the number of gear teeth on the position coder side for each gear in rigid tapping.

NOTE
When a position coder is attached to the spindle, set the same value for all of parameters No.5231 through No.5234.

5241	Maximum spindle speed in rigid tapping (first gear)
5242	Maximum spindle speed in rigid tapping (second gear)
5243	Maximum spindle speed in rigid tapping (third gear)
5244	Maximum spindle speed in rigid tapping (fourth gear)

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 9999

Spindle position coder gear ratio
1 : 1 0 to 7400
1 : 2 0 to 9999
1 : 4 0 to 9999
1 : 8 0 to 9999

Each of these parameters is used to set a maximum spindle speed for each gear in rigid tapping.
Set the same value for both parameter No.5241 and parameter No.5243 for a one-stage gear system. For a two-stage gear system, set the same value as set in parameter No. 5242 in parameter No. 5243. Otherwise, alarm PS0200 will be issued. This applies to the M series.

5261	**Time constant for acceleration/deceleration in rigid tapping for each gear (first gear)**
5262	**Time constant for acceleration/deceleration in rigid tapping for each gear (second gear)**
5263	**Time constant for acceleration/deceleration in rigid tapping for each gear (third gear)**
5264	**Time constant for acceleration/deceleration in rigid tapping for each gear (fourth gear)**

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] msec
[Valid data range] 0 to 4000

Each of these parameters is used to set a linear acceleration/ deceleration time constant for the spindle of each gear and the tapping axis in rigid tapping.
Set the period required to reach each maximum spindle speed (parameters No.5241 to No.5244).
The set time constant, multiplied by the ratio of a specified S value to a maximum spindle speed, is actually used as a time constant.
For bell-shaped acceleration/deceleration, set a time constant for a linear portion.

5271	**Time constant for acceleration/deceleration in rigid tapping extraction (first gear)**
5272	**Time constant for acceleration/deceleration in rigid tapping extraction (second gear)**
5273	**Time constant for acceleration/deceleration in rigid tapping extraction (third gear)**
5274	**Time constant for acceleration/deceleration in rigid tapping extraction (fourth gear)**

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] msec
[Valid data range] 0 to 4000

Each of these parameters is used to set a linear acceleration/ deceleration time constant for the spindle of each gear and tapping axis in extraction operation during rigid tapping.
For bell-shaped acceleration/deceleration, set a time constant for a linear portion.

In interpolation type rigid tapping, linear/bell-shaped acceleration/ deceleration of constant acceleration time type is used. So, set a time constant directly for the spindle and tapping axis for each gear.

> **NOTE**
> These parameters are enabled when the parameter TDR (bit 2 of parameter No.5201) is set to 1.

5280	**Position control loop gain for the spindle and tapping axis in rigid tapping (common to gears)**

5281	**Position control loop gain for the spindle and tapping axis in rigid tapping (first gear)**

5282	**Position control loop gain for the spindle and tapping axis in rigid tapping (second gear)**

5283	**Position control loop gain for the spindle and tapping axis in rigid tapping (third gear)**

5284	**Position control loop gain for the spindle and tapping axis in rigid tapping (fourth gear)**

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] 0.01/sec
[Valid data range] 1 to 9999

Each of these parameters is used to set a position control loop gain for the spindle and tapping axis in rigid tapping. These parameters significantly affect the precision of threading. Optimize these parameters as well as the loop gain multipliers by conducting a cutting test.

> **NOTE**
> To use a varied loop gain on a gear-by-gear basis, set parameter No.5280 to 0, and set a loop gain for each gear in parameters No.5281 to No.5284. The specification of a loop gain on a gear-by-gear basis is disabled if parameter No.5280 is set to a value other than 0. In such a case, the value set in parameter No.5280 is used as a loop gain that is common to all the gears.

5291	Loop gain multiplier for the spindle in rigid tapping (first gear)
5292	Loop gain multiplier for the spindle in rigid tapping (second gear)
5293	Loop gain multiplier for the spindle in rigid tapping (third gear)
5294	Loop gain multiplier for the spindle in rigid tapping (fourth gear)

[Input type] Parameter input
[Data type] Word spindle
[Valid data range] 1 to 32767

Each of these parameters is used to set a loop gain multiplier for the spindle in rigid tapping each gear.

These parameters significantly affect the precision of threading. Optimize these parameters as well as the loop gains by conducting a cutting test.

Loop gain multiplier GC is obtained from the following equation:

$$GC = \frac{2048000 \times 360 \times PC \times E}{PLS \times SP \times L}$$

PLS Number of pulses output from the position coder (pulses/rev)
SP Number of gear teeth on the spindle side
PC Number of gear teeth on the position coder side
E Specified voltage (V) for turning the spindle motor at 1000 min^{-1}
L Angular displacement of the spindle (degrees) per spindle motor rotation

Example:

For the spindle motor and gear ratio given below, GC is calculated as follows:

$$GC = \frac{2048000 \times 360 \times 1 \times 2.2}{4096 \times 1 \times 360} = 1100$$

PLS = 4096 pulse/rev
SP = 1
PC = 1
E = 2.2 V
L = 360 deg

NOTE

1. On the assumption that the spindle motor used turns at 4500 min^{-1} at 10 V, 2.2 V is required to turn the spindle motor at 1000 min^{-1}
2. These parameters are used for analog spindles.

5300	Tapping axis in-position width in rigid tapping (first spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a tapping axis in-position width when rigid tapping is performed using the first spindle.

NOTE
Set the following parameter for each spindle:

First spindle	No.5300
Second spindle	No.5302
Third spindle	No.5304
Fourth spindle	No.5306

5301	Spindle in-position width in rigid tapping

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 32767

These parameters are used to set spindle in-position widths in rigid tapping.

NOTE
If an excessively large value is specified, the threading precision will deteriorate.

5302	Tapping axis in-position width in rigid tapping (second spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a tapping axis in-position width when rigid tapping is performed using the second spindle.

5304	Tapping axis in-position width in rigid tapping (third spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a tapping axis in-position width when rigid tapping is performed using the third spindle.

5306	Tapping axis in-position width in rigid tapping (fourth spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a tapping axis in-position width when rigid tapping is performed using the fourth spindle.

5310	Positional deviation limit imposed during tapping axis movement in rigid tapping (first spindle)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets a positional deviation limit imposed during tapping axis movement in rigid tapping using the first spindle.

NOTE

Set the following parameter for each spindle:

First spindle	No.5310
Second spindle	No.5350
Third spindle	No.5354
Fourth spindle	No.5358

5311	Limit value of spindle positioning deviation during movement in rigid tapping

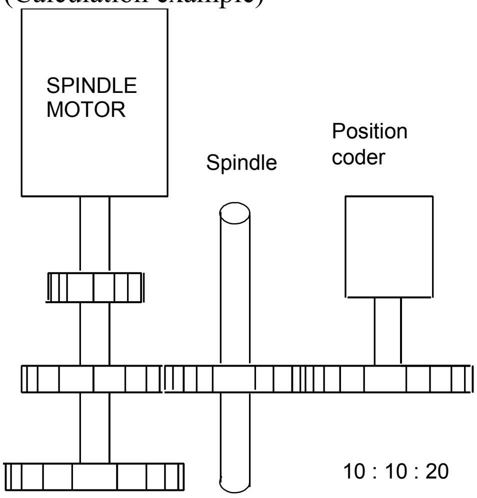
[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets the limit value of a spindle positioning deviation during movement in rigid tapping.
Find a value to be set from the following expression:

$$Setting\ value = \frac{S \times PLS \times 100 \times SP \times C}{60 \times GP \times C}$$

S Maximum spindle speed in rigid tapping (min^{-1})
(Setting value of parameter Nos. 5241 and greater)
PLS Number of pulses output from the position coder (pulses/rev)
SP Number of gear teeth on the spindle side
PC Number of gear teeth on the position coder side
G Loop gain in the rigid tapping ($0.01sec^{-1}$)
(Setting value of parameter Nos. 5281 and greater)
C Coefficient 1.5

(Calculation example)



S=3600
PLS=4096
SP=10
PC=20
G=3000
C=1.5

$$Setting\ value = \frac{3600 \times 4096 \times 100 \times 10 \times 1.5}{60 \times 3000 \times 20} = 6144$$

5312	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (first spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets a positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the first spindle.

NOTE

Set the following parameter for each spindle:

First spindle	No.5312
Second spindle	No.5352
Third spindle	No.5356
Fourth spindle	No.5360

5313	Positional deviation limit imposed while the spindle is stopped in rigid tapping

[Input type] Parameter input
[Data type] 2-word spindle
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter is used to set a positional deviation limit imposed while the spindle is stopped in rigid tapping.

5321	Spindle backlash in rigid tapping (first-stage gear)
5322	Spindle backlash in rigid tapping (second-stage gear)
5323	Spindle backlash in rigid tapping (third-stage gear)
5324	Spindle backlash in rigid tapping (fourth-stage gear)

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] Detection unit
[Valid data range] -9999 to 9999

Each of these parameters is used to set a spindle backlash.

5350	Positional deviation limit imposed during tapping axis movement in rigid tapping (second spindle)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets a positional deviation limit imposed during tapping axis movement in rigid tapping using the second spindle.

5352	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (second spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter is used to set a positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the second spindle.

5354	Positional deviation limit imposed during tapping axis movement in rigid tapping (third spindle)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets a positional deviation limit imposed during tapping axis movement in rigid tapping using the third spindle.

5356	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (third spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter is used to set a positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the third spindle.

5358	Positional deviation limit imposed during tapping axis movement in rigid tapping (fourth spindle)

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets a positional deviation limit imposed during tapping axis movement in rigid tapping using the fourth spindle.

5360	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping (fourth spindle)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter is used to set a positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the fourth spindle.

5365	Bell-shaped acceleration/deceleration time constant in rigid tapping (first-stage gear)

5366	Bell-shaped acceleration/deceleration time constant in rigid tapping (second-stage gear)

5367	Bell-shaped acceleration/deceleration time constant in rigid tapping (third-stage gear)

5368	Bell-shaped acceleration/deceleration time constant in rigid tapping (fourth-stage gear)

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] msec
[Valid data range] 0 to 512

Each of these parameters is used to set a time constant for a curved portion when bell-shaped acceleration/deceleration is selected in rigid tapping. When 0 is set in this parameter, linear acceleration/deceleration is performed.

> **NOTE**
> This parameter is enabled when the parameter RBL (bit 5 of parameter No.5203) is set to 1.

5381	Override value during rigid tapping return

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 0 to 200

This parameter is used to set the override value during rigid tapping return.
If the setting is 0, no override is applied.

> **NOTE**
> This parameter is valid when bit 4 (DOV) of parameter No. 5200 for enabling override at normal extraction time is set to 1.

5382	Amount of return for rigid tapping return

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the drilling axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter is used to set an extra amount of rigid tapping return. The tool is retracted additionally near point R by the distance set in this parameter. If the tool has already been retracted from rigid tapping, it will be retracted further only by the distance specified in this parameter.

4.23 PARAMETERS OF SCALING/COORDINATE ROTATION

	#7	#6	#5	#4	#3	#2	#1	#0
5400	SCR	XSC				D3R		RIN

[Input type] Parameter input
[Data type] Bit path

 # 0 RIN Coordinate rotation angle command (R)
0: Specified by an absolute method
1: Specified by an absolute method (G90) or incremental method (G91)

 # 2 D3R The three-dimensional coordinate conversion mode can be cancelled by:
0: The G69 (M series) command, the G69.1 (T series) command, a reset operation, or a CNC reset by signal input from the PMC.
1: The G69 (M series) command or G69.1 (T series) command only.

 # 6 XSC The setting of a scaling magnification (axis-by-axis scaling) is:
0: Disabled.
1: Enabled.

 # 7 SCR Scaling (G51) magnification unit
0: 0.00001 times (1/100,000)
1: 0.001 times

	#7	#6	#5	#4	#3	#2	#1	#0
5401								SCLx

[Input type] Parameter input
[Data type] Bit axis

 # 0 SCLx Scaling on this axis
0: Invalidated
1: Validated

5411	Scaling (G51) magnification

[Input type]	Setting input
[Data type]	2-word path
[Unit of data]	0.001 or 0.00001 times (Selected using SCR, #7 of parameter No.5400)
[Valid data range]	1to999999999

This parameter sets a scaling magnification when axis-by-axis scaling is disabled (with bit 6 (XSC) of parameter No. 5400 set to 0). If no scaling magnification (P) is specified in the program, the setting of this parameter is used as a scaling magnification.

> **NOTE**
> When bit 7 (SCR) of parameter No. 5400 is set to 1, the valid data range is 1 to 9999999.

5412	Rapid traverse rate for a hole machining cycle in three-dimensional coordinate conversion mode

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets a rapid traverse rate for a hole machining cycle in the three-dimensional coordinate conversion mode.

5421	Scaling magnification for each axis

[Input type]	Setting input
[Data type]	2-word axis
[Unit of data]	0.001 or 0.00001 times (Selected using SCR, #7 of parameter No.5400)
[Valid data range]	-999999999 to –1, 1 to 999999999

This parameter sets a scaling magnification for each axis when axis-by-axis scaling is enabled (with bit 6 (XSC) of parameter No. 5400 set to 1). For the first spindle to the third spindle (X-axis to Z-axis), the setting of this parameter is used as a scaling magnification if scaling magnifications (I, J, K) are not specified in the program.

> **NOTE**
> When bit 7 (SCR) of parameter No. 5400 is set to 1, the valid data ranges are -9999999 to -1 and 1 to 9999999.

4.24 PARAMETERS OF SINGLE DIRECTIONAL POSITIONING

	#7	#6	#5	#4	#3	#2	#1	#0
5431							PDI	MDL

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 MDL The G60 code (one-direction positioning) is:
0: One-shot G code (group 00).
1: Modal G code (group 01).

 # 1 PDI In the G60 mode, an in-position check at a stop position is:
0: Not made.
1: Made.

5440	Positioning direction and overrun distance in single directional positioning

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] -32767 to 32767

This parameter sets the positioning direction and overrun distance in single directional positioning (G60) for each axis. The positioning direction is specified using a setting data sign, and the overrun distance using a value set here.
Overrun distance>0: The positioning direction is positive (+).
Overrun distance<0: The positioning direction is negative (*).
Overrun distance=0: Single directional positioning is not performed.

4.25 PARAMETERS OF POLAR COORDINATE INTERPOLATION

	#7	#6	#5	#4	#3	#2	#1	#0
5450						PLS		PDI

[Input type] Parameter input
[Data type] Bit path

 # 0 PDI When the second axis on the plane in the polar coordinate interpolation mode is based on radius specification:
0: Radius specification is used.
1: Diameter specification is used.

 # 2 PLS The polar coordinate interpolation shift function is:
0: Not used.
1: Used.
This enables machining using the workpiece coordinate system with a desired point which is not the center of the rotation axis set as the origin of the coordinate system in polar coordinate interpolation.

5460	Axis (linear axis) specification for polar coordinate interpolation

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes
This parameter sets control axis numbers of linear axis to execute polar interpolation.

5461	Axis (rotation axis) specification for polar coordinate interpolation

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes
This parameter sets control axis numbers of rotation axis to execute polar interpolation.

5463	Automatic override tolerance ratio for polar coordinate interpolation

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 100
Typical setting: 90% (treated as 90% when set to 0)
Set the tolerance ratio of the fastest cutting feedrate to the speed of the rotation axis during automatic override of polar coordinate interpolation.

5464	Compensation for error on hypothetical axis of polar coordinate interpolation

[Input type]	Parameter input
[Data type]	Byte path
[Unit of data]	mm, inch (input unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A)) (For IS-B, -999999.999 to +999999.999)

This parameter is used to set the error if the center of the rotation axis on which polar coordinate interpolation is performed is not on the X-axis.

If the setting of the parameter is "0", regular polar coordinate interpolation is performed.

4.26 PARAMETERS OF NORMAL DIRECTION CONTROL

5480	Number of the axis for controlling the normal direction

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to the maximum controlled axis number

This parameter sets the controlled axis number of the axis for controlling the normal direction.

5481	Feedrate of rotation of the normal direction controlled axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg/min
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)

This parameter sets the feedrate of the movement along the normal direction controlled axis that is inserted at the start point of a block during normal direction control.

5482	Limit value used to determine whether to ignore the rotation insertion of the normal direction controlled axis

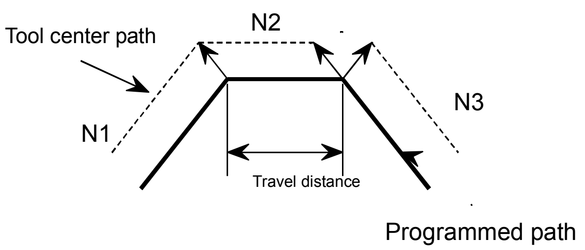
[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))

The rotation block of the normal direction controlled axis is not inserted when the rotation insertion angle calculated during normal direction control does not exceed this setting.
The ignored rotation angle is added to the next rotation insertion angle, and the block insertion is then judged.

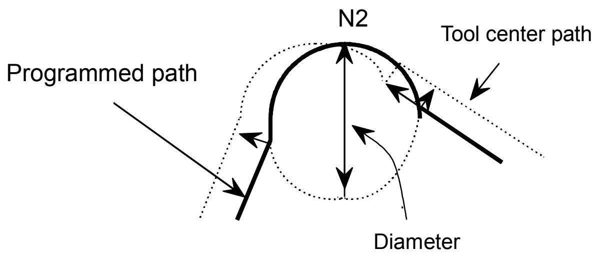
> **NOTE**
> 1 No rotation block is inserted when 360 or more degrees are set.
> 2 If 180 or more degrees are set, a rotation block is inserted only when the circular interpolation setting is 180 or more degrees.

5483	Limit value of movement that is executed at the normal direction angle of a preceding block

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to standard parameter setting table (B)



For straight line
When the travel distance of N2 in the figure on the left does not exceed the setting, block N2 is machined with the tool being normal to block N1.

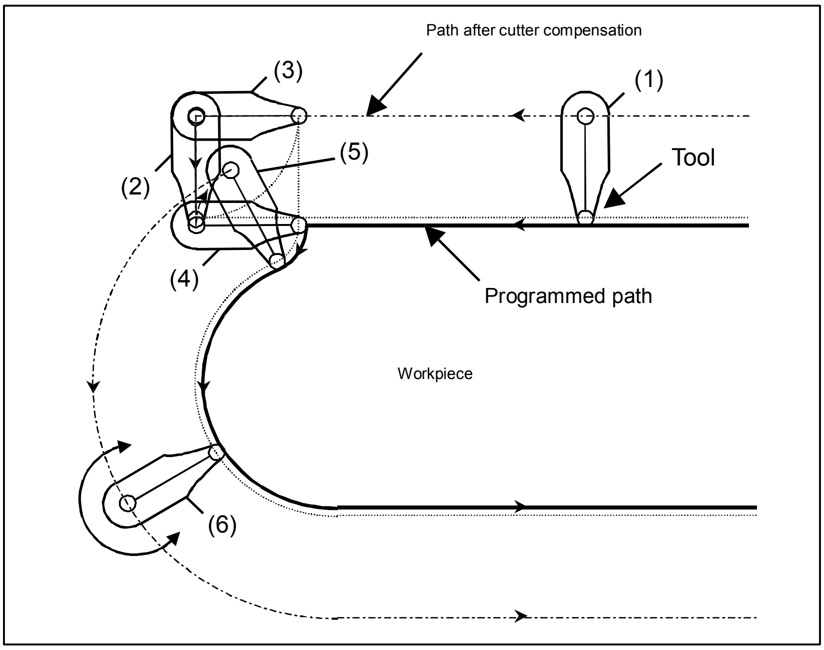


For arc
When the arc diameter of N2 in the figure on the left does not exceed the setting, arc N2 is machined with the tool being normal to block N1. A normal direction axis is not controlled to move in the normal direction according to the arc movement.

	#7	#6	#5	#4	#3	#2	#1	#0
5484							CTI	

[Input type] Parameter input
[Data type] Bit path
CTI If such an arc that the vector from the center of the arc to a start point rotates in the reverse direction after cutter compensation is specified during normal direction control in the cutter compensation C mode:
0 : The alarm (PS0041) is issued.
1 : The command is executed.
When this parameter is set to 1, such an arc that the vector from the center of the arc to a start point rotates in the reverse direction after cutter compensation may be specified during normal direction control in the cutter compensation C mode (see the tool path from (4) to (5) in the figure below). In this case, the tool is controlled so that the tool faces in the direction normal to the move direction (programmed path) before cutter compensation (see the tool path from (2) to (3) in the figure below).

Thus, as shown by the programmed path from (4) to (5) in the figure below, the inside of an arc where the radius of the workpiece is smaller than the compensation value of the tool can be cut.



NOTE
When this parameter is set to 1, no interference check is made in cutter compensation C.

4.27 PARAMETERS OF INDEX TABLE INDEXING

	#7	#6	#5	#4	#3	#2	#1	#0
5500	IDX	SIM		G90	INC	ABS	REL	DDP

[Input type] Parameter input
[Data type] Bit path

 # 0 DDP As the method for inputting a decimal point in a command for the index table indexing axis:
0: The conventional method is used.
1: The pocket calculator method is used.

 # 1 REL The position display of the index table indexing axis in the relative coordinate system is:
0: Not rounded by one rotation.
1: Rounded by one rotation.

 # 2 ABS The position display of the index table indexing axis in the absolute coordinate system is:
0: Not rounded by one rotation.
1: Rounded by one rotation.

 # 3 INC When the M code that specifies rotation in the negative direction (parameter No. 5511) is not set, rotation in the G90 mode is:
0: Not set to the shorter way around the circumference.
1: Set to the shorter way around the circumference.

 # 4 G90 A command for the index table indexing axis is:
0: Assumed to be an absolute or incremental command according to the mode.
1: Always assumed to be an absolute command.

 # 6 SIM When the same block includes a command for the index table indexing axis and a command for another controlled axis:
0: The alarm (PS1564) is issued.
1: The commands are executed. (In a block other than G00, G28, or G30, however, the alarm (PS1546) is issued.)

 # 7 IDX Operation sequence of the index table indexing axis:
0: Type A
1: Type B

	#7	#6	#5	#4	#3	#2	#1	#0
5501							ISP	ITI

[Input type] Parameter input
[Data type] Bit path

 # 0 ITI The index table indexing function is:
0: Enabled.
1: Disabled.

 # 1 ISP Servo-off for an index axis at the completion of clamping is:
0: Processed by the CNC.
1: Not processed by the CNC. (The CNC follows the status of the servo-off signal (G0126) input from the PMC.)

5510	Controlled axis number of the index table indexing axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

This parameter sets the number of a controlled axis to be used as the index table indexing axis.
When 0 is set, the fourth axis is assumed.

5511	M code that specifies rotation in the negative direction for index table indexing

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 99999999

0: The rotation direction for the index table indexing axis is determined according to the setting of bit 3 (INC) of parameter No. 5500 and a command.
1 to 99999999:
The rotation for the index table indexing axis is always performed in the positive direction. It is performed in the negative direciton only when a move command is specified together with the M code set in this parameter.

> **NOTE**
> Be sure to set bit 2 (ABS) of parameter No. 5500 to 1.

5512	Minimum positioning angle for the index table indexing axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the minimum positioning angle (travel distance) for the index table indexing axis. The travel distance specified in the positioning command must always be an integer multiple of this setting. When 0 is set, the travel distance is not checked.

The minimum positioning angle is checked not only for the command, but also for the coordinate system setting and workpiece origin offset.

4.28 PARAMETERS OF INVOLUTE INTERPOLATION

5610	Limit of initial permissible error during involute interpolation

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the allowable limit of deviation between an involute curve passing through a start point and an involute curve passing through an end point for an involute interpolation command.

5620	Lower override limit in automatic feedrate control during involute interpolation

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 100

In "override in the cutter compensation mode" under involute interpolation automatic feedrate control, the feedrate of the tool center near a basic circle may become very low in the case of an inner offset. To prevent this, set a lower override limit in this parameter.
Thus, the feedrate is clamped so that the feedrate is not lower than a specified feedrate multiplied by the lower override limit set in this parameter.

> **NOTE**
> When 0 or a value not within the valid data range is set, involute interpolation automatic feedrate control ("override in the cutter compensation mode" and "acceleration clamping near a basic circle") is disabled.

4.29 PARAMETERS OF EXPONENTIAL INTERPOLATION

	#7	#6	#5	#4	#3	#2	#1	#0
5630								SPN

[Input type] Parameter input
[Data type] Bit path

 # 0 SPN The amount of linear axis division (span value) in exponential interpolation is:
0: Specified with parameter No.5643.
1: Specified using address K in a block containing G02.3/G03.3. When address K is not specified, the value set with parameter No.5643 is used.

5641	Linear axis number subject to exponential interpolation

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

This parameter sets the ordinal number, among the controlled axes, for the linear axis to which exponential interpolation is applied.

5642	Rotation axis number subject exponential interpolation

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

This parameter sets the ordinal number, among the controlled axes, for the rotation axis to which exponential interpolation is applied.

5643	Amount of linear axis division (span value) in exponential interpolation

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to 999999999

This parameter sets an amount of linear axis division in exponential interpolation when bit 0 (SPN) of parameter No. 5630 is set to 0 or when address K is not specified.

4.30 PARAMETERS OF STRAIGHTNESS COMPENSATION

5711	**Straightness compensation : Axis number of moving axis 1**
5712	**Straightness compensation : Axis number of moving axis 2**
5713	**Straightness compensation : Axis number of moving axis 3**
5721	**Straightness compensation : Axis number of compensation axis 1 for moving axis 1**
5722	**Straightness compensation : Axis number of compensation axis 2 for moving axis 2**
5723	**Straightness compensation : Axis number of compensation axis 3 for moving axis 3**
5731	**Straightness compensation : Compensation point number a of moving axis 1**
5732	**Straightness compensation : Compensation point number b of moving axis 1**
5733	**Straightness compensation : Compensation point number c of moving axis 1**
5734	**Straightness compensation : Compensation point number d of moving axis 1**

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Detection unit
[Valid data range] 0 to 1023

These parameters set compensation point numbers in stored pitch error compensation.
Set four compensation point for each moving axis.

5741	**Straightness compensation : Compensation point number a of moving axis 2**
5742	**Straightness compensation : Compensation point number b of moving axis 2**
5743	**Straightness compensation : Compensation point number c of moving axis 2**
5744	**Straightness compensation : Compensation point number d of moving axis 2**

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 1023

These parameters set compensation point numbers in stored pitch error compensation.
Set four compensation point for each moving axis.

5751	**Straightness compensation : Compensation point number a of moving axis 3**
5752	**Straightness compensation : Compensation point number b of moving axis 3**
5753	**Straightness compensation : Compensation point number c of moving axis 3**
5754	**Straightness compensation : Compensation point number d of moving axis 3**

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 1023

These parameters set compensation point numbers in stored pitch error compensation.
Set four compensation point for each moving axis.

5761	Compensation corresponding compensation point number a of moving axis 1
5762	Compensation corresponding compensation point number b of moving axis 1
5763	Compensation corresponding compensation point number c of moving axis 1
5764	Compensation corresponding compensation point number d of moving axis 1

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

Each of these parameters sets a compensation value for each moving axis compensation point.

5771	Compensation corresponding compensation point number a of moving axis 2
5772	Compensation corresponding compensation point number b of moving axis 2
5773	Compensation corresponding compensation point number c of moving axis 2
5774	Compensation corresponding compensation point number d of moving axis 2

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

Each of these parameters sets a compensation value for each moving axis compensation point.

5781	Compensation corresponding compensation point number a of moving axis 3
5782	Compensation corresponding compensation point number b of moving axis 3
5783	Compensation corresponding compensation point number c of moving axis 3
5784	Compensation corresponding compensation point number d of moving axis 3

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

Each of these parameters sets a compensation value for each moving axis compensation point.

4.31 PARAMETERS OF INCLINATION COMPENSATION

5861	**Inclination compensation : Compensation point number a for each axis**
5862	**Inclination compensation : Compensation point number b for each axis**
5863	**Inclination compensation : Compensation point number c for each axis**
5864	**Inclination compensation : Compensation point number d for each axis**

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1023

These parameters set the compensation points for inclination compensation. The points are set for the compensation point numbers for stored pitch error compensation.

5871	**Inclination compensation : Compensation α at compensation point number a for each axis**
5872	**Inclination compensation : Compensation β at compensation point number b for each axis**
5873	**Inclination compensation : Compensation γ at compensation point number c for each axis**
5874	**Inclination compensation : Compensation δ at compensation point number d for each axis**

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Unit of data] Detection unit
[Valid data range] -32767 to 32767

Each of these parameters sets a compensation value for each axis compensation point.

4.32 PARAMETERS OF CUSTOM MACROS

	#7	#6	#5	#4	#3	#2	#1	#0
6000	SBV		SBM	HGO			MGO	G67
	SBV		SBM	HGO	V15		MGO	G67

[Input type] Parameter input
[Data type] Bit path

 # 0 G67 If the macro continuous-state call cancel command (G67) is specified when the macro continuous-state call mode (G66/G66.1) is not set:
0: Alarm PS0122 is issued.
1: The specification of G67 is ignored.

 # 1 MGO When a GOTO statement for specifying custom macro control is executed, a high-speed branch to 20 sequence numbers executed from the start of the program is:
0: A high-speed branch is not caused to n sequence numbers from the start of the executed program.
1: A high-speed branch is caused to n sequence numbers from the start of the program.

 # 3 V15 As system variable numbers for tool offset:
0 : The standard system variable numbers for the Series 16 are used.
1 : The same system variable numbers as those used for the Series 15 are used.
The tables below indicate the system variables for tool offset numbers 1 to 999. The values for tool offset numbers 1 to 200 can be read from or assigned to the system variables in parentheses.

(1) Tool offset memory A

	System variable number	
	V15 = 0	V15 = 1
Wear offset value	#10001 to #10999 (#2001 to #2200)	#10001 to #10999 (#2001 to #2200)

(2) Tool offset memory B

	System variable number	
	V15 = 0	V15 = 1
Geometry offset value	#11001 to #11999 (#2201 to #2400)	#10001 to #10999 (#2001 to #2200)
Wear offset value	#10001 to #10999 (#2001 to #2200)	#11001 to #11999 (#2201 to #2400)

(3) Tool offset memory C

		System variable number	
		V15 = 0	V15 = 1
Tool length offset	Geometry offset value	#11001 to #11999 (#2201 to #2400)	#10001 to #10999 (#2001 to #2200)
	Wear offset value	#10001 to #10999 (#2001 to #2200)	#11001 to #11999 (#2201 to #2400)
Tool radius offset	Geometry offset value	#13001 to #13999	#12001 to #12999
	Wear offset value	#12001 to #12999	#13001 to #13999

 # 4 HGO When a GOTO statement in a custom macro control command is executed, a high-speed branch to the 30 sequence numbers immediately before the executed statement is:
0: Not made.
1: Made.

 # 5 SBM Custom macro statement
0: Not stop the single block
1: Stops the single block
If you want to disable the single blocks in custom macro statements using system variable #3003, set this parameter to 0. If this parameter is set to 1, the single blocks in custom macro statements cannot be disabled using system variable #3003. To control single blocks in custom macro statements using system variable #3003, use bit 7 (SBV) of parameter No. 6000.

 # 7 SBV Custom macro statement
0: Not stop the single block
1: Enable/disable single block stop with system variable #3003

		Parameter SBM (No.6000#5)	
		0	**1**
Parameter SBV (No.6000#7)	**0**	Disables single block stop.	Enables single block stop. (With variable #3003, single block stop cannot be enabled/disabled. Single block stop is enabled at all times.)
	1	Enables single block stop. (With variable #3003, single block stop can be enabled/disabled.)	

	#7	#6	#5	#4	#3	#2	#1	#0
6001		CCV	TCS	CRO	PV5		PRT	MIF

[Input type] Parameter input
[Data type] Bit path

 # 0 MIF The custom macro interface signals are based on:
0: Standard specification.
(The signals UI000 to UI015, UO000 to UO015, and UO100 to UO131 are used.)
1: Extended specification.
(The signals UI000 to UI031, UI100 to UI131, UI200 to UI231, UI300 to UI331, UO000 to UO031, UO100 to UO131, UO200 to UO231, and UO300 to UO331 are used.)

 # 1 PRT Reading zero when data is output using a DPRINT command
0: Outputs a space
1: Outputs no data

 # 3 PV5 Custom macro common variables:
0: #500 to #549 are output. (Note 1)
1: #100 to #149 and #500 to 549 are output. (Note 1)

> **NOTE**
> The variables depend on the selected options.

		Custom macro common variable addition option	
		Not selected	Selected
Embedded macro option	Not selected	#500 to #549 or #100 to #149 and #500 to #549	#500 to #999 or #100 to #199 and #500 to #999
	Selected	#500 to #549 or #100 to #499 and #500 to #549	#500 to #999 or #100 to #49 and #500 to #999

 # 4 CRO ISO code in BPRWT or DPRNT command
- 0: Outputs only “LF” after data is output
- 1: Outputs “LF” and “CR” after data is output

 # 5 TCS Custom macro (subprogram)
- 0: Not called using a T code
- 1: Called using a T code

 # 6 CCV Common variables #100 to #149(NOTE) cleared by power-off are:
- 0: Cleared to <null>
- 1: Not cleared

> **NOTE**
> The variables depend on the selected options.

		Custom macro common variable addition option	
		Not selected	Selected
Embedded macro option	Not selected	#100to#149	#100to#199
	Selected	#100to#499	

	#7	#6	#5	#4	#3	#2	#1	#0
6003	MUS		MSB	MPR	TSE	MIN	MSK	

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 1 MSK Absolute coordinates at that time during custom macro interrupt
- 0: Not set to the skip coordinates (system variables #5061 and later)
- 1: Set to the skip coordinates (system variables #5061 and later)

 # 2 MIN Custom macro interrupt
- 0: Performed by interrupting an in-execution block (Custom macro interrupt type I)
- 1: Performed after an in-execution block is completed (Custom macro interrupt type II)

 # 3 TSE Custom macro interrupt signal UINT
0: Edge trigger method (Rising edge)
1: Status trigger method

 # 4 MPR Custom macro interrupt valid/invalid M code
0: M96/M97
1: M code set using parameters (Nos. 6033 and 6034)

 # 5 MSB Interrupt program
0: Uses a dedicated local variable (Macro-type interrupt)
1: Uses the same local variable as in the main program (Subprogram- type interrupt)

 # 7 MUS Interrupt-type custom macro
0: Not used
1: Used

	#7	#6	#5	#4	#3	#2	#1	#0
6004						VHD		NAT
			D15					NAT

[Input type] Parameter input
[Data type] Bit path

 # 0 NAT The results of the custom macro functions ATAN (with 2 arguments) and ASIN are specified as follows:
0: The result of ATAN is 0 to 360.0.
The result of ASIN is 270.0 to 0 to 90.0.
1: The result of ATAN is -180.0 to 0 to 180.0.
The result of ASIN is -90.0 to 0 to 90.0.

 # 2 VHD With system variables #5121 to #5140:
0: The tool offset value (geometry offset value) in the block currently being executed is read. (This parameter is valid only when tool geometry/tool wear compensation memories are available.)
1: An interrupt travel distance based on manual handle interrupt is read.

 # 5 D15 When tool compensation memory C is used, for reading or writing tool offset values (for up to offset number 200) for D code (tool radius), the same system variables, #2401 through #2800, as Series 15 are:

0: Not used.

1: Used.

When bit 3 (V15) of parameter No. 6000 is set to 1

D code				
Compensation number	Geometry		Wear	
	Variable number	Variable name	Variable number	Variable name
1	#2401	[#_OFSDG[1]]	#2601	[#_OFSDW[1]]
2	#2402	[#_OFSDG[2]]	#2602	[#_OFSDW[2]]
3	#2403	[#_OFSDG[3]]	#2603	[#_OFSDW[3]]
:	:	:	:	:
199	#2599	[#_OFSDG[199]]	#2799	[#_OFSDW[199]]
200	#2600	[#_OFSDG[200]]	#2800	[#_OFSDW[200]]

	#7	#6	#5	#4	#3	#2	#1	#0
6007				CVA	MGE	BCS	SCS	DPG

[Input type] Parameter input
[Data type] Bit path

 # 0 DPG Specifies whether to allow G codes with a decimal point to be called.

0: Do not allow.

1: Allow.

 # 1 SCS Specifies whether to call subprograms with S codes.

0: Do not call with S codes.

1: Call with S codes.

 # 2 BCS Specifies whether to call subprograms with the second auxiliary function codes.

0: Do not call with the second auxiliary function codes.

1: Call with the second auxiliary function codes.

 # 3 MGE Specifies whether a G code modal call is made after movement or for each block.

0: Make a call for each block (equivalent to G66.1).

1: Make a call after movement (equivalent to G66).

 # 4 CVA The format for macro call arguments is specified as follows:

0: Arguments are passed in NC format without modifications.

1: Arguments are converted to macro format then passed.

Example)

When G65 P_ X10 ; is specified, the value in local variable #24 in the calling program is set as follows:

Command	CVA=0	CVA=1
#24	0.01	0.01
ADP[#24]	10.0	0.01

> **NOTE**
> External operations are the same unless the ADP function is used.

	#7	#6	#5	#4	#3	#2	#1	#0
6008	IJK	GMP	ADD	ISO	KOP	DSM	MCA	F16

[Input type] Parameter input

[Data type] Bit path

 # 0 F16 The precision of operation is based on:

0: New specification.

1: FS16i compatible specification.

 # 1 MCA A macro alarm specification based on system variable #3000 is selected as follows:

0: An alarm number obtained by adding 3000 to a value assigned to variable #3000 and the corresponding message are displayed. (A value from 0 to 200 can be assigned to variable #3000.)

1: A value assigned to variable #3000 and the corresponding message are displayed. (A value from 0 to 4095 can be assigned to variable #3000.)

(Example)

Execution of #3000=1 (ALARM MESSAGE);

When bit 1 (MCA) of parameter No. 6008 is set to 0:

The alarm screen displays "3001 ALARM MESSAGE".

When bit 1 (MCA) of parameter No. 6008 is set to 1:

The alarm screen displays "MC0001 ALARM MESSAGE".

 # 2 DSM On the custom macro screen, the rewriting of a system variable that can be specified (written) on the left side from the MDI panel is:

0: Disabled.

1: Enabled.

 # 3 KOP When the NC is reset in the state where the line is made open by POPEN:

0: Communication continues, and the line is left open.

1: Communication stops, and the line is closed.

 # 4 ISO

0: When the EIA code is used, the bit patters of codes specified instead of [,], #, *, =, ?, @, &, and _ are set in parameter No. 6010 to No. 6018.

1: When the ISO/ASCII code is used, the bit patters of codes specified instead of [,], #, *, =, ?, @, &, and _ are set in parameter No. 6010 to No. 6018.

 # 5 ADD When the number of digits in the integer part, a, in the format specification [a,b] of the DPRNT statement is less than the number of digits in the integer part of an output variable value:

0: The specified number of digits only are output, with the unspecified digits discarded.

1: An alarm for excessive digits is issued.

 # 6 GMP The calling of M, S, T, a second auxiliary function code, or a particular code during the calling of a G code, and the calling of a G code during the calling of M, S, T, a second auxiliary function code, or particular code are:

0: Not allowed. (They are executed as an ordinary G, M, S, T, second auxiliary function code, and NC address.)

1: Allowed.

#7 IJK For addresses I, J, and K specified as arguments:

0: Argument specification I or II is automatically determined.

1: Argument specification I is always used.

Example

When K_J_I_ is specified:

- When this parameter is set to 0:
  Argument specification II is used and K=#6, J=#8, and I=#10 are specified.
- When this parameter is set to1:
  Argument specification I is used and I=#4, J=#5, and K=#6 are specified regardless of the spcification order.
  (Argument specification II cannot be used.)

	#7	#6	#5	#4	#3	#2	#1	#0
6010	*7	*6	*5	*4	*3	*2	*1	*0
6011	=7	=6	=5	=4	=3	=2	=1	=0
6012	#7	#6	#5	#4	#3	#2	#1	#0
6013	[7	[6	[5	[4	[3	[2	[1	[0
6014	]7	]6	]5	]4	]3	]2	]1	]0
6015	?7	?6	?5	?4	?3	?2	?1	?0
6016	@7	@6	@5	@4	@3	@2	@1	@0
6017	&7	&6	&5	&4	&3	&2	&1	&0
6018	_7	_6	_5	_4	_3	_2	_1	_0

[Input type] Parameter input
[Data type] Bit path

*0 to *7 : The bit pattern of the EIA or ISO/ASCII code indicating * is set.
=0 to =7 : The bit pattern of the EIA or ISO/ASCII code indicating = is set.
#0 to #7 : The bit pattern of the EIA or ISO/ASCII code indicating # is set.
[0 to [7 : The bit pattern of the EIA or ISO/ASCII code indicating [is set.
]0 to]7 : The bit pattern of the EIA or ISO/ASCII code indicating] is set.
?0 to ?7 : The bit pattern of the EIA or ISO/ASCII code indicating ? is set.
@0 to @7 : The bit pattern of the EIA or ISO/ASCII code indicating @ is set.
&0 to &7 : The bit pattern of the EIA or ISO/ASCII code indicating & is set.
_0 to _7 : The bit pattern of the EIA or ISO/ASCII code indicating _ is set.
0: A corresponding bit is 0.
1: A corresponding bit is 1.

6030	M code to execute external device subprogram calls

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 99999999

Set the M code to execute external device subprogram calls. When 0 is set, M198 is used. M01, M02, M30, M98, and M99 cannot be used to execute external device subprogram calls. When a negative number, 1, 2, 30, 98, or 99 is set for this parameter, M198 is used to execute external device subprogram calls.

6031	Start number of common variables to be protected among the common variables (#500 to #999)

6032	End number of common variables to be protected among the common variables (#500 to #999)

[Input type] Parameter input
[Data type] Word path
[Valid data range] 500 to 999

Among the common variables (#500 to #999), the range of common variables specified by this parameter can be protected (by setting their attributes to read-only). If a write attempt (on the left side) is made, an alarm is issued.

> **NOTE**
> Set 0 in both parameter No. 6031 and No. 6032 not to protect common variables.

6033	M code that validates a custom macro interrupt

6034	M code that invalidates a custom macro interrupt

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 03 to 99999999 (excluding 30, 98 and 99)

These parameters can be used when MPR, #4 of parameter No.6003, is 1. M96 is used as a valid M code and M97 is used as an invalid M code when MPR is 0, irrespective of the state of this parameter.

6036	Number of custom macro variables common to tool path (for #100 to #199 (#499))

[Input type] Parameter input
[Data type] Word system common
[Valid data range] 0 to 400

When the memory common to paths is used, this parameter sets the number of custom macro common variables to be shared (custom macro variables common to paths). Common variables #100 to #199 (up to #499 in a system with the embedded macro option) may be shared. Ensure that the maximum number of usable macro common variables is not exceeded.

Example
When 20 is set in parameter No. 6036
#100 to #119: Shared by all paths
#120 to #149: Used by each path independently

Example)
When 20 is set in parameter No. 6036
#100 to #119: Shared by all paths
#120 to #149: Used by each path independently

NOTE
1 To use up to #199, the option for adding custom macro common variables is required.
2 To use up to #499, the embedded macro option is required.
3 When 0 or a negative value is set, the memory common to paths is not used.

6037	Number of custom macro variables common to tool path (for #500 to #999)

[Input type] Parameter input
[Data type] Word system common
[Valid data range] 0 to 500

When the memory common to paths is used, this parameter sets the number of custom macro common variables to be shared (custom macro variables common to paths). Common variables #500 to #999 may be shared. Ensure that the maximum number of usable macro common variables is not exceeded.

Example
When 50 is set in parameter No. 6037
#500 to #549: Shared by all paths #120 to #149:
#550 to #599: Used by each path independently

NOTE

1. To use up to #999, the option for adding custom macro common variables is required.
2. When 0 or a negative value is set, the memory common to paths is not used.

6038	Start G code used to call a custom macro

[Input type] Parameter input
[Data type] Word path
[Valid data range] -9999 to 9999

6039	Start program number of a custom macro called by G code

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 9999

6040	Number of G codes used to call custom macros

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 255

Set this parameter to define multiple custom macro calls using G codes at a time. With G codes as many as the value set in parameter No. 6040 starting with the G code set in parameter No. 6038, the custom macros of program numbers as many as the value set in parameter No. 6040 starting with the program number set in parameter No. 6039 can be called. Set 0 in parameter No. 6040 to disable this mode of calling.

If a negative value is set in parameter No. 6038, the modal call mode is entered. Whether the modal call is equivalent to G66 or G66.1 depends on bit 3 (MGE) of parameter No. 6007.

Example)

When parameter No. 6038 = 900, parameter No. 6039 = 1000, and parameter No. 6040 = 100 are set, a set of 100 custom macro calls (simple calls) is defined as follows:

G900 → O1000
G901 → O1001
G902 → O1002
:
G999 → O1099

When the setting of parameter No. 6038 is changed to -900, the same set of custom macro calls (modal calls) is defined.

> **NOTE**
> 1 When the following conditions are satisfied, all calls using these parameters are disabled:
>   1) When a value not within the specifiable range is set in each parameter
>   2) (Value of parameter No.6039 + value of parameter No.6040 - 1) > 9999
> 2 The specification of a mixture of simple calls and modal calls is not allowed.
> 3 If a range of G codes set by these parameters duplicate G codes specified in parameter No.6050 to No.6059, the calls specified by parameter No.6050 to 6059 are made preferentially.

6041	Start G code with a decimal point used to call a custom macro

[Input type] Parameter input
[Data type] Word path
[Valid data range] -999 to 999

6042	Start program number of a custom macro called by G code with a decimal point

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 9999

6043	Number of G codes with a decimal point used to call custom macros

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 255

Set this parameter to define multiple custom macro calls using G codes with a decimal point at a time. With G codes with a decimal point as many as the value set in parameter No. 6043 starting with the G code with a decimal point set in parameter No. 6041, the custom macros of program numbers as many as the value set in parameter No. 6043 starting with the program number set in parameter No. 6042 can be called. Set 0 in parameter No. 6043 to disable this mode of calling.

If a negative value is set in parameter No. 6041, the modal call mode is entered. Whether the modal call is equivalent to G66 or G66.1 depends on bit 3 (MGE) of parameter No. 6007.

Example)

When parameter No. 6041 = 900, parameter No. 6042 = 2000, and parameter No. 6043 = 100 are set, a set of 100 custom macro calls (simple calls) is defined as follows:

G90.0 → O2000
G90.1 → O2001
G90.2 → O2002

:
G99.9 → O2099
When the setting of parameter No. 6041 is changed to -900, the same set of custom macro calls (modal calls) is defined.

> **NOTE**
> 1 When the following conditions are satisfied, all calls using these parameters are disabled:
> 1) When a value not within the specifiable range is set in each parameter
> 2) (Value of parameter No.6042 + value of parameter No.6043 - 1) > 9999
> 3) When bit 0 (DPG) of parameter No. 6007 = 0 (to disable calls using G codes with a decimal point)
> 2 The specification of a mixture of simple calls and modal calls is not allowed.
> 3 If a range of G codes set by these parameters duplicate G codes specified in parameter No.6060 to No.6069, the calls specified by parameter No.6060 to 6069 are made preferentially.

6044	Start M code used to call a subprogram

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999

6045	Start program number of a subprogram called by M code

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 9999

6046	Number of M codes used to call subprograms (number of subprograms called by M codes)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 32767

Set this parameter to define multiple subprogram calls using M codes at a time. With M codes as many as the value set in parameter No. 6046 starting with the M code set in parameter No. 6044, the subprograms of program numbers as many as the value set in parameter No. 6046 starting with the program number set in 6045 can be called. Set 0 in parameter No. 6046 to disable this mode of calling.

Example)
When parameter No. 6044 = 80000000, parameter No. 6045 = 3000, and parameter No. 6046 = 100 are set, a set of 100 subprogram calls is defined as follows:

M80000000 → O3000
M80000001 → O3001
M80000002 → O3002
:
M80000099 → O3099

> **NOTE**
> 1 When the following conditions are satisfied, all calls using these parameters are disabled:
> 1) When a value not within the specifiable range is set in each parameter
> 2) (Value of parameter No. 6045 + value of parameter No. 6046 - 1) > 9999
> 2 If a range of M codes set by these parameters duplicate M codes specified in parameter No. 6071 to No. 6079, the calls specified by parameter No. 6071 to 6079 are made preferentially.

6047	Start M code used to call a custom macro

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999

6048	Start program number of a custom macro called by M code

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 9999

6049	Number of M codes used to call custom macros (number of custom macros called by M codes)

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 32767

Set this parameter to define multiple custom macro calls using M codes at a time. With M codes as many as the value set in parameter No. 6049 starting with the M code set in parameter No. 6047, the custom macros of program numbers as many as the value set in parameter No. 6049 starting with the program number set in parameter No. 6048 can be called. Set 0 in parameter No. 6049 to disable this mode of calling.

Example)

When parameter No. 6047 = 90000000, parameter No. 6048 = 4000, and parameter No. 6049 = 100 are set, a set of 100 custom macro calls (simple calls) is defined as follows:

M90000000 → O4000
M90000001 → O4001
M90000002 → O4002

:
M90000099 → O4099

> **NOTE**
> 1 When the following conditions are satisfied, all calls using these parameters are disabled:
> 1) When a value not within the specifiable range is set in each parameter
> 2) (Value of parameter No. 6048 + value of parameter No. 6049 - 1) > 9999
> 2 If a range of M codes set by these parameters duplicate M codes specified in parameter No. 6080 through No. 6089, the calls specified by parameter No. 6080 through 6089 are made preferentially.
> 3 When a 5-digit or longer O number is used, the option for 8-digit program numbers is required.

6050	G code that calls the custom macro of program number 9010
to	
6059	G code that calls the custom macro of program number 9019

[Input type] Parameter input
[Data type] Word path
[Valid data range] (-9999 to 9999 : excluding 0, 5, 65, 66 and 67)

Set the G codes used to call the custom macros of program numbers 9010 to 9019. However, note that when a negative value is set in this parameter, it becomes a modal call. For example, if this parameter is set to -11, the modal call mode is entered by G11.
Whether the modal call is equivalent to G66 or G66.1 depends on bit 3 (MGE) of parameter No. 6007.

6060	**G code with a decimal point used to call the custom macro of program number 9040**
to	
6069	**G code with a decimal point used to call the custom macro of program number 9049**

[Input type] Parameter input
[Data type] Word path
[Valid data range] -999 to 999

Set the G codes used to call the custom macros of program numbers 9040 to 9049. However, note that when a negative value is set in this parameter, it becomes a modal call. For example, if this parameter is set to -11, the modal call mode is entered by G1.1.
Whether the modal call is equivalent to G66 or G66.1 depends on bit 3 (MGE) of parameter No. 6007. Set G codes in the format Gm.n. The value expressed by (m×10+n) is set in the parameter. The values m and n must satisfy the following relationships: 0 ≤m ≤99, 0 ≤n ≤9.

6071	**M code used to call the subprogram of program number 9001**
to	
6079	**M code used to call the subprogram of program number 9009**

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999 (excluding 30, 98 and 99)

These parameters set the M codes that call the subprograms of program numbers 9001 to 9009.

NOTE
If the same M code is set in these parameters, the younger number is called preferentially. For example, if 100 is set in parameter No. 6071 and 6072, and programs O9001 and O9002 both exist, O9001 is called when M100 is specified.

6080	**M code used to call the custom macro of program number 9020**
to	
6089	**M code used to call the custom macro of program number 9029**

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 3 to 99999999 (excluding 30, 98 and 99)

Set the M codes used to call the custom macros of program numbers 9020 to 9029. The simple call mode is set.

> **NOTE**
> 1 If the same M code is set in these parameters, the younger number is called preferentially. For example, if 200 is set in parameter No. 6081 and No. 6082, and programs O9021 and O9022 both exist, O9021 is called when M200 is specified.
> 2 If the same M code is set in a parameter (No. 6071 to No. 6079) used to call subprograms and in a parameter (No. 6080 to No. 6089) used to call custom macros, a custom macro is called preferentially. For example, if 300 is set in parameter No. 6071 and No. 6081, and programs O9001 and O9021 both exist, O9021 is called when M300 is specified.

6090	ASCII code that calls the subprogram of program number 9004

6091	ASCII code that calls the subprogram of program number 9005

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 65(A:41H) to 90(Z:5AH)

These parameters set the ASCII codes that call subprograms in decimal.
The settable addresses are indicated below.

Address	Parameter setting value	T series	M series
A	65	O	O
B	66	O	O
D	68	X	O
F	70	O	O
H	72	O	O
I	73	O	O
J	74	O	O
K	75	O	O
L	76	O	O
M	77	O	O
P	80	O	O
Q	81	O	O
R	82	O	O
S	83	O	O
T	84	O	O
V	86	X	O
X	88	X	O
Y	89	X	O
Z	90	X	O

> **NOTE**
> 1 When address L is set, the number of repeats cannot be specified.
> 2 Set 0 when no subprogram is called.

4.33 PARAMETERS OF SKIP FUNCTION

	#7	#6	#5	#4	#3	#2	#1	#0
6200	SKF	SRE	SLS	HSS			SK0	GSK

[Input type] Parameter input
[Data type] Bit path

 # 0 GSK As a skip signal, the skip signal SKIPP is:
0: Invalid.
1: Valid.

 # 1 SK0 This parameter specifies whether the skip signal is made valid under the state of the skip signal SKIP and the multistage skip signals SKIP2 to SKIP8.
0: Skip signal is valid when these signals are 1.
1: Skip signal is valid when these signals are 0.

 # 4 HSS
0: The skip function does not use high-speed skip signals while skip signals are input. (The conventional skip signal is used.)
1: The step skip function uses high-speed skip signals while skip signals are input.

 # 5 SLS
0: The multi-step skip function does not use high-speed skip signals while skip signals are input. (The conventional skip signal is used.)
1: The multi-step skip function uses high-speed skip signals while skip signals are input.

> **NOTE**
> The skip signals (SKIP and SKIP2 to SKIP8) are valid regardless of the setting of this parameter. They can also be disabled using bit 4 (IGX) of parameter No. 6201.

 # 6 SRE When a high-speed skip signal or high-speed measurement position arrival signal is used:
0: The signal is assumed to be input on the rising edge (contact open → close).
1: The signal is assumed to be input on the falling edge (contact close → open).

 # 7 SKF Dry run, override, and automatic acceleration/deceleration for G31 skip command
0: Disabled
1: Enabled

	#7	#6	#5	#4	#3	#2	#1	#0
6201	SKPXE		CSE	IGX		TSE	SEB	

[Input type] Parameter input
[Data type] Bit path

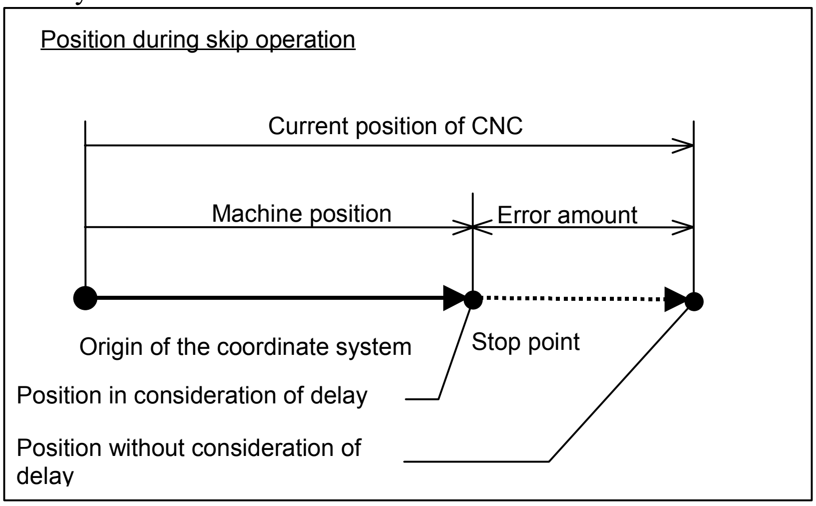
 # 1 SEB When a skip signal or measurement position arrival signal goes on while the skip function, or the automatic tool length measurement (M series) or automatic tool compensation (T series) is used, the accumulated pulses and positional deviation due to acceleration/deceleration are:

0: Ignored.
1: Considered and compensated.

The accumulated pulses and positional deviation due to actual acceleration/deceleration when the skip signal or measurement position arrival signal goes on are considered to obtain the position at which the signal is input.

 # 2 TSE When the torque limit skip function (G31 P99/98) is used, the skip position held in a system variable (#5061 to #5080) is:

0: Position that is offset considering the delay (positional deviation) incurred by the servo system.
1: Position that does not reflect the delay incurred by the servo system.



 # 4 IGX When the high-speed skip function is used, SKIP, SKIPP, and SKIP2 to SKIP8 are:

0: Enabled as skip signals.
1: Disabled as skip signals.

 # 5 CSE For the continuous high-speed skip command, high-speed skip signals are:

0: Effective at either a rising or falling edge (depending on the setting of bit 6 (SRE) of parameter No. 6200).
1: Effective at both the rising and falling edges.

 # 7 SKPXE For the skip function (G31), the skip signal SKIP is:
0: Disabled.
1: Enabled.

Whether the skip signals are enabled or disabled

Parameter	IGX (No.6201#4)	GSK (No.6200#0)	SKPXE (No.6201#7)	Skip signal SKIPP	Skip signal SKIP	Multistage skip signals SKIP2-SKIP8
Setting	0	0	0	Disabled	Enabled	Enabled
	0	1	0	Enabled	Enabled	Enabled
	0	0	1	Disabled	Disabled	Enabled
	0	1	1	Enabled	Disabled	Enabled
	1	0	0	Disabled	Disabled	Disabled
	1	1	0	Disabled	Disabled	Disabled
	1	0	1	Disabled	Disabled	Disabled
	1	1	1	Disabled	Disabled	Disabled

Bit 4 (IGX) of parameter No. 6201 is valid for the skip function using high-speed skip signals (when bit 4 (HSS) of parameter No. 6200 is set to 1) or for the multistage skip function using high-speed skip signals (when bit 5 (SLS) of parameter No. 6200 is set to 1).
To use multistage skip signals, the multistage skip function option is required.

	#7	#6	#5	#4	#3	#2	#1	#0
6202	1S8	1S7	1S6	1S5	1S4	1S3	1S2	1S1

[Input type] Parameter input
[Data type] Bit path

1S1 to 1S8 These parameters specify whether to enable or disable each high-speed skip signal when the G31 skip command is issued.
The following table shows the correspondence between the bits, input signals, and commands.
The settings of the bits have the following meaning :
0: The high-speed skip signal corresponding to a bit is disabled.
1: The high-speed skip signal corresponding to a bit is enabled.

Parameter	High-speed skip signals
1S1	HDI0
1S2	HDI1
1S3	HDI2
1S4	HDI3
1S5	HDI4
1S6	HDI5
1S7	HDI6
1S8	HDI7

NOTE
Do not specify the same signal simultaneously for different paths.

	#7	#6	#5	#4	#3	#2	#1	#0
6203	2S8	2S7	2S6	2S5	2S4	2S3	2S2	2S1
6204	3S8	3S7	3S6	3S5	3S4	3S3	3S2	3S1
6205	4S8	4S7	4S6	4S5	4S4	4S3	4S2	4S1
6206	DS8	DS7	DS6	DS5	DS4	DS3	DS2	DS1

[Input type] Parameter input
[Data type] Bit path

1S1to1S8, 2S1to2S8, 3S1to3S8, 4S1to4S8, DS1toDS8

Specify which skip signal is enabled when the skip command (G31, or G31P1 to G31P4) and the dwell command (G04, G04Q1 to G04Q4) are issued with the multi-step skip function.
The following table shows the correspondence between the bits, input signals, and commands.
The setting of the bits have the following meaning :
0: The skip signal corresponding to a bit is invalid.
1: The skip signal corresponding to a bit is enabled.

Multi-step skip function					
Command / Input signal	G31 G31P1 G04Q1	G31P2 G04Q2	G31P3 G04Q3	G31P4 G04Q4	G04
SKIP/HDI0	1S1	2S1	3S1	4S1	DS1
SKIP2/HDI1	1S2	2S2	3S2	4S2	DS2
SKIP3/HDI2	1S3	2S3	3S3	4S3	DS3
SKIP4/HDI3	1S4	2S4	3S4	4S4	DS4
SKIP5/HDI4	1S5	2S5	3S5	4S5	DS5
SKIP6/HDI5	1S6	2S6	3S6	4S6	DS6
SKIP7/HDI6	1S7	2S7	3S7	4S7	DS7
SKIP8/HDI7	1S8	2S8	3S8	4S8	DS8

NOTE
HDI0 to HDI7 are high-speed skip signals.

	#7	#6	#5	#4	#3	#2	#1	#0
6207						SFN	SFP	

[Input type] Parameter input
[Data type] Bit path

 # 1 SFP The feedrate used when the skip function (G31) is being executed is:
0: Feedrate of a programmed F code.
1: Feedrate set in parameter No. 6281.

> **NOTE**
> For the multi-stage skip function and high-speed skip, see the description of bit 2 (SFN) of parameter No. 6207.

 # 2 SFN The feedrate used when the skip function based on high-speed skip signals (with bit 1 (HSS) of parameter No. 6200 set to 1) or the multi-skip function is being executed is:

0: Feedrate of a programmed F code.
1: Feedrate set in a parameter from parameter No. 6282 to No. 6285.

> **NOTE**
> For not the multistage skip function, but the skip function using no high-speed skip signals (when bit 4 (HSS) of parameter No. 6200 is set to 0), see the description of bit 1 (SFP) of parameter No. 6207.

	#7	#6	#5	#4	#3	#2	#1	#0
6208	9S8	9S7	9S6	9S5	9S4	9S3	9S2	9S1

[Input type] Parameter input
[Data type] Bit path

9S1 to 9S8 Specify which high-speed skip signal is enabled for the continuous high-speed skip command G31P90 or the EGB skip command G31.8.
The settings of each bit have the following meaning:

0: The high-speed skip signal corresponding to the bit is disabled.
1: The high-speed skip signal corresponding to the bit is enabled.

The bits correspond to signals as follows:

Parameter	High-speed skip signal
9S1	HDI0
9S2	HDI1
9S3	HDI2
9S4	HDI3
9S5	HDI4
9S6	HDI5
9S7	HDI6
9S8	HDI7

	#7	#6	#5	#4	#3	#2	#1	#0
6210		MDC				DSK		

[Input type] Parameter input
[Data type] Bit path

 # 2 DSK Skip position reading by the detection unit is:

0: Disabled.
1: Enabled.

 # 6 MDC The measurement result of automatic tool length measurement (M series) or automatic tool compensation (T series) is:
0: Added to the current offset.
1: Subtracted from the current offset.

	#7	#6	#5	#4	#3	#2	#1	#0
6215								CSTx

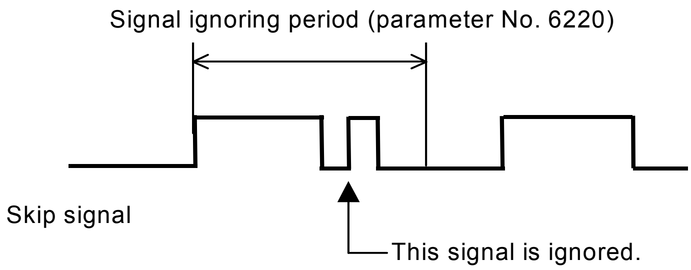
[Input type] Parameter input
[Data type] Bit axis

 # 0 CSTx On a Cs contour control axis, torque limit skip operation is:
0: Not performed.
1: Performed.
Torque limit skip operation is performed using the torque limit command signal TLMH and the load detection signal LDT1 of the serial spindle.

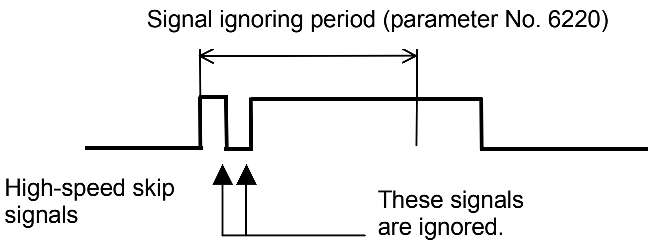
6220	Period during which skip signal input is ignored for the continuous high-speed skip function and EGB axis skip function

[Input type] Parameter input
[Data type] Byte path
[Unit of data] 8msec
[Valid data range] 3 to 127(× 8msec)

This parameter specifies the period from when a skip signal is input to when the next skip signal can be input for the continuous high-speed skip function and EGB axis skip function. This parameter is used to ignore chattering in skip signals.
If a value that falls outside the valid range is specified, the setting is assumed to be 24 msec.



When high-speed skip signals are used and bit 5 (CSE) of parameter No. 6201 is set to 1, signals are handled as follows:



6221	Torque limit dead zone time for a torque limit skip command

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] msec
[Valid data range] 0 to 65535

The torque limit skip arrival signal is ignored for a set period of time.
If G31P98 is specified, skip operation is not performed for a set period of time after the torque limit skip arrival signal is set to 1.
If G31P99 is specified, skip operation is not performed for a set period of time after the torque limit skip arrival signal is set to 1.
However, if a skip signal is input, skip operation is performed, regardless of the period of time set in this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
6224	1A8	1A7	1A6	1A5	1A4	1A3	1A2	1A1

[Input type] Parameter input
[Data type] Bit path

1A1 to 1A8 Specify which high-speed measurement position arrival signal is to be enabled for each AE1 signal of G37 (automatic tool length measurement (M series) or automatic tool compensation (T series)).

Parameter	Corresponding high-speed measurement position arrival signal
1A1	HAE1
1A2	HAE2
1A3	HAE3
1A4	HAE4
1A5	HAE5
1A6	HAE6
1A7	HAE7
1A8	HAE8

0: The corresponding high-speed measurement position arrival signal is disabled.
1: The corresponding high-speed measurement position arrival signal is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
6225	2A8	2A7	2A6	2A5	2A4	2A3	2A2	2A1

[Input type] Parameter input
[Data type] Bit path

2A1 to 2A8 Specify which high-speed measurement position arrival signal is enabled for each AE2 signal of G37 (automatic tool length measurement (M series) or automatic tool compensation (T series)).

Parameter	Corresponding high-speed measurement position arrival signal
2A1	HAE1
2A2	HAE2
2A3	HAE3
2A4	HAE4
2A5	HAE5
2A6	HAE6
2A7	HAE7
2A8	HAE8

0: The corresponding high-speed measurement position arrival signal is disabled.
1: The corresponding high-speed measurement position arrival signal is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
6226	3A8	3A7	3A6	3A5	3A4	3A3	3A2	3A1

[Input type] Parameter input
[Data type] Bit path

3A1 to 3A8 Specify which high-speed measurement position arrival signal is to be enabled for each AE3 signal of G37 (automatic tool length measurement (M series) or automatic tool compensation (T series)).

Parameter	Corresponding high-speed measurement position arrival signal
3A1	HAE1
3A2	HAE2
3A3	HAE3
3A4	HAE4
3A5	HAE5
3A6	HAE6
3A7	HAE7
3A8	HAE8

0: The corresponding high-speed measurement position arrival signal is disabled.
1: The corresponding high-speed measurement position arrival signal is enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
6240							AMH	AE0

[Input type] Parameter input
[Data type] Bit path

 # 0 AE0 Measurement position arrival is assumed when the automatic tool compensation signals XAE1 and XAE2 <X004#0,1> (T series) or the automatic tool length measurement signals XAE1, XAE2, and XAE3 <X004#0,1,2> (M series) are:
0: 1.
1: 0.

 # 1 AMH For automatic tool compensation signals (T series) or automatic tool length measurement signals (M series), a high-speed measurement position arrival signal is:
0: Not used.
1: Used.

6241	Feedrate during measurement of automatic tool compensation (T series) (for the XAE1 and GAE1 signals)
	Feedrate during measurement of automatic tool length measurement (M series) (for the XAE1 and GAE1 signals)

6242	Feedrate during measurement of automatic tool compensation (T series) (for the XAE2 and GAE2 signals)
	Feedrate during measurement of automatic tool length measurement (M series) (for the XAE2 and GAE2 signals)

6243	
	Feedrate during measurement of automatic tool length measurement (M series) (for the XAE3 and GAE3 signals)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, deg/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)
These parameters set the relevant feedrate during measurement of automatic tool compensation (T series) or automatic tool length measurement (M series).

> **NOTE**
> When the setting of parameter No. 6242 or 6243 is 0, the setting of parameter No. 6241 is used.

6251	γ value on the X axis during automatic tool compensation (T series)

	γ value during automatic tool length measurement (M series) (for the XAE1 and GAE1 signals)

6252	**γ value on the Z axis during automatic tool compensation (T series)**
	γ value during automatic tool length measurement (M series) (for the XAE2 and GAE2 signals)

6253	
	γ value during automatic tool length measurement (M series) (for the XAE3 and GAE3 signals)

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] mm, inch, deg (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the relevant γ value during automatic tool compensation (T series) or automatic tool length measurement (M series).

NOTE
1 For the M series, when the setting of parameter No. 6252 or 6253 is 0, the setting of parameter No. 6251 is used.
2 Set a radius value regardless of whether diameter or radius programming is specified.

6254	ε value on the X axis during automatic tool compensation (T series)
	ε value during automatic tool length measurement (M series) (for the XAE1 and GAE1 signals)

6255	ε value on the Z axis during automatic tool compensation (T series)
	ε value during automatic tool length measurement (M series) (for the XAE2 and GAE2 signals)

6256	
	ε value during automatic tool length measurement (M series) (for the XAE3 and GAE3 signals)

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] mm, inch, deg (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the relevant ε value during automatic tool compensation (T series) or automatic tool length measurement (M series).

> **NOTE**
> 1 For the M series, when the setting of parameter No. 6255 or 6256 is 0, the setting of parameter No. 6254 is used.
> 2 Set a radius value regardless of whether diameter or radius programming is specified.

6281	Feedrate for the skip function (G31)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets a feedrate for the skip function (G31). This parameter is valid when bit 1 (SFP) of parameter No. 6207 is set to 1.

> **NOTE**
> For the multi-stage skip function and high-speed skip, see the description of parameter No. 6282 to No. 6285.

6282	Feedrate for the skip function (G31, G31 P1)

6283	Feedrate for the skip function (G31 P2)

6284	Feedrate for the skip function (G31 P3)

6285	Feedrate for the skip function (G31 P4)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)
Each of these parameters sets a feedrate for each skip function G code. These parameters are valid when bit 2 (SFN) of parameter No. 6207 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
6286								TQO

[Input type] Parameter input
[Data type] Bit axis

 # 0 TQO The torque limit override function is:
0: Disabled. (Override of 100%)
1: Enabled.

6287	Positional deviation limit in torque limit skip

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 327670
This parameter sets a positional deviation limit for each axis imposed when torque limit skip is specified. When the actual positional deviation exceeds the positional deviation limit, the alarm (SV0004) is issued and an immediate stop takes place.

4.34 PARAMETERS OF EXTERNAL DATA INPUT/OUTPUT

	#7	#6	#5	#4	#3	#2	#1	#0
6300	EEX			ESR	ESC			

[Input type] Parameter input
[Data type] Bit path

 # 3 ESC When a reset is input between the input of the external data input read signal ESTB and the execution of a search, the external program number search function:
- 0: Performs a search.
- 1: Does not perform a search.

 # 4 ESR The external program number search function is:
- 0: Disabled.
- 1: Enabled.

 # 7 EEX PMC EXIN function
- 0: Conventional specifications
- 1: Extended specifications

If you want to use external machine coordinate system shift which handles ±10.000 or more shift unavailable with the PMC/EXIN command in the conventional specifications, set 1.
When this function is used for a multi-path system, the setting for path 1 is used.
For details of EXIN and how to change ladder software, refer to the PMC manuals.

	#7	#6	#5	#4	#3	#2	#1	#0
6301					EED	NNO	EXM	EXA

[Input type] Parameter input
[Data type] Bit machine group

 # 0 EXA This bit selects an external alarm message specification.
- 0: A message number from 0 to 999 can be sent. The CNC adds 1000 to an alarm number for distinction from general alarms.
- 1: A message number from 0 to 4095 can be sent. The CNC prefixes the character string "EX" to a alarm number for display.

 # 1 EXM This bit selects an external operator message specification.
- 0: A message number from 0 to 999 can be sent. The message of a message number from 0 to 99 is displayed together with its number. The CNC adds 2000 to a number for distinction. A message number from 100 to 999 is not displayed on the screen, but only the corresponding message is displayed on the screen.
- 1: A message number from 0 to 4095 can be sent. The message of a message number from 0 to 99 is displayed together with its number. The CNC prefixes the character string "EX" to a message number for display. A message number from 100 to

4095 is not displayed on the screen, but only the corresponding message is displayed on the screen.

 # 2 NNO When operator messages are set by external data input, a new line operation between one message set with a number and another message set with a different number is:
0: Performed.
1: Not performed.

 # 3 EED To specify data for external tool compensation and external workpiece coordinate system shift, use:
0: Signals ED15 to ED0.
(The value which can be specified for tool compensation and workpiece coordinate system shift is from 0 to ±7999.)
1: Signals ED31 to ED0.
(The value which can be specified for tool compensation and workpiece coordinate system shift is from 0 to ±79999999.)

6310	Setting for number addition to external operator messages

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word machine group
[Valid data range] 0 to 4095

This parameter sets the number of messages to which message numbers are to be prefixed in external operator message display.
When 0 is set, the same operation as when 100 is set is performed.

Example)
When 500 is set in this parameter, the messages of message numbers 0 to 499 are displayed together with their numbers on the screen. A message number of 500 and up is not displayed on the screen, but only the corresponding message is displayed on the screen.

4.35 PARAMETERS OF FINE TORQUE SENSING

6360	**Target axis 1 for fine torque sensing**
6361	**Target axis 2 for fine torque sensing**
6362	**Target axis 3 for fine torque sensing**
6363	**Target axis 4 for fine torque sensing**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] -4 to 24

Specify axes subject to fine torque sensing. When servo axes are subject to fine torque sensing, specify controlled axis numbers in the range 1 to the maximum number of controlled axes. When spindles are subject to fine torque sensing, reverse the sign of the spindle numbers and specify spindle numbers in the range –1 to the maximum number of controlled spindles with the minus sign.

4.36 PARAMETERS OF GRAPHIC DISPLAY

6510	**Specifying the graphic coordinate system**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 12

Specify the graphic coordinate system in tool path drawing.

4.37 PARAMETERS OF SCREEN DISPLAY COLORS (1 OF 2)

6581	RGB value of color palette 1 for text
6582	RGB value of color palette 2 for text
6583	RGB value of color palette 3 for text
6584	RGB value of color palette 4 for text
6585	RGB value of color palette 5 for text
6586	RGB value of color palette 6 for text
6587	RGB value of color palette 7 for text
6588	RGB value of color palette 8 for text
6589	RGB value of color palette 9 for text
6590	RGB value of color palette 10 for text
6591	RGB value of color palette 11 for text
6592	RGB value of color palette 12 for text
6593	RGB value of color palette 13 for text
6594	RGB value of color palette 14 for text
6595	RGB value of color palette 15 for text

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 151515

Each of these parameters sets the RGB value of each color palette for text by specifying a 6-digit number as described below.
rrggbb: 6-digit number (rr: red data, gg: green data, bb: blue data)
The valid data range of each color is 0 to 15 (same as the tone levels on the color setting screen). When a number equal to or greater than 16 is specified, the specification of 15 is assumed.
Example)
When the tone level of a color is: red:1 green:2, blue:3, set 10203 in the parameter.

4.38 PARAMETERS OF RUN HOUR AND PARTS COUNT DISPLAY

	#7	#6	#5	#4	#3	#2	#1	#0
6700							PRT	PCM

[Input type] Parameter input
[Data type] Bit path

 # 0 PCM M code that counts the total number of machined parts and the number of machined parts
0: M02, or M30, or an M code specified by parameter No.6710
1: Only M code specified by parameter No.6710

 # 1 PRT Upon reset, the required parts count arrival signal (PRTSF) is:
0: Set to "0".
1: Not set to "0".

6710	M code that counts the number of machined parts

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 999999999

The total number of machined parts and the number of machined parts are counted (+1) when the M code set is executed.

> **NOTE**
> The setting of 0 is invalid (no count operation is performed with M00.) Moreover, M98, M99, M198 (external device subprogram calling), and M codes used for subprogram calling and macro calling cannot be set as M codes for count-up operation. (Even when such an M code is set, count-up operation is not performed, ignoring the M code.)

6711	Number of machined parts

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 999999999

The number of machined parts is counted (+1) together with the total number of machined parts when the M02, M30, or a M code specified by parameter No.6710 is executed.

> **NOTE**
> The number of parts is not counted for M02, M03, when bit 0 (PCM) of parameter No. 6700 is set to 1.

6712	Total number of machined parts

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 999999999

This parameter sets the total number of machined parts.
The total number of machined parts is counted (+1) when M02, M30, or an M code specified by parameter No.6710 is executed.

> **NOTE**
> The number of parts is not counted for M02, M30, when bit 0 (PCM) of parameter No. 6700 is set to 1.

6713	Number of required parts

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 999999999

This parameter sets the number of required machined parts.
Required parts finish signal PRTSF <F0062#7> is output to PMC when the number of machined parts reaches the number of required parts. The number of parts is regarded as infinity when the number of required parts is zero. The PRTSF signal is then not output.

6750	Integrated value of power-on period

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the integrated value of power-on period.

6751	Operation time (integrated value of time during automatic operation) 1

[Input type] Setting input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 59999

For details, see the description of parameter No. 6752.

6752	Operation time (integrated value of time during automatic operation) 2

[Input type] Setting input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the integrated value of time during automatic operation (neither stop nor hold time included).
The actual time accumulated during operation is the sum of this parameter No. 6751 and parameter No. 6752.

6753	Integrated value of cutting time 1

[Input type] Setting input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 59999

For details, see the description of parameter No. 6754.

6754	Integrated value of cutting time 2

[Input type] Setting input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the integrated value of a cutting time that is performed in cutting feed such as linear interpolation (G01) and circular interpolation (G02 or G03).
The actual time accumulated during cutting is the sum of this parameter No. 6753 and parameter No. 6754.

6755	Integrated value of general-purpose integrating meter drive signal (TMRON) ON time 1

[Input type] Setting input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 59999

For details, see the description of parameter No. 6756.

6756	Integrated value of general-purpose integrating meter drive signal (TMRON) ON time 2

[Input type] Setting input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the integrated value of a time while input signal TMRON <G0053#0> from PMC is on.
The actual integrated time is the sum of this parameter No. 6755 and parameter No. 6756.

6757	Operation time (integrated value of one automatic operation time) 1

[Input type] Setting input
[Data type] 2-word path
[Unit of data] msec
[Valid data range] 0 to 59999

For details, see the description of parameter No. 6758.

6758	Operation time (integrated value of one automatic operation time) 2

[Input type] Setting input
[Data type] 2-word path
[Unit of data] min
[Valid data range] 0 to 999999999

This parameter displays the one automatic operation drive time (neither stop nor hold state included). The actual time accumulated during operating is the sum of this parameter No. 6757 and parameter No. 6758. The operation time is automatically preset to 0 during the power-on sequence and the cycle start from the reset state.

4.39 PARAMETERS OF TOOL LIFE MANAGEMENT (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
6801						LVF		

[Input type] Parameter input
[Data type] Bit path

 # 2 LVF When the life of a tool is counted in terms of time with the tool management function, the tool life count override signals *TLV0 to *TLV9<G049#0 to G050#1> are:
0: Invalid.
1: Valid.

6811	Tool life count restart M code

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 255 (not including 01, 02, 30, 98, and 99)

When 0 is set, this parameter is ignored.
When an M code for tool life count restart is specified, the counting of the life of the tool attached at the spindle position is started.
When the type for counting the number of use times is selected, the target of life counting is switched to the tool attached at the spindle position, and the life count is incremented by 1.
When the type for counting time is selected, the target of life counting is switched to the tool attached at the spindle position, with no other operations performed.
If the tool attached at the spindle position is not a tool under tool life management, no operation is performed.

4.40 PARAMETERS OF POSITION SWITCH FUNCTIONS

	#7	#6	#5	#4	#3	#2	#1	#0
6901						PSA	EPW	

[Input type] Parameter input
[Data type] Bit path

 # 1 EPW The number of position switches is:
0: Not extended.
1: Extended.

 # 2 PSA In determination of a position switch function operation range, a servo delay amount (positional deviation) and a delay amount in acceleration/deceleration control are:
0: Not considered.
1: Considered.

6910	Controlled axis for which the 1-st position switch function is performed (PSWA01)
6911	Controlled axis for which the 2-nd position switch function is performed (PSWA02)
:	
6925	Controlled axis for which the 16-th position switch function is performed (PSWA16)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the controlled axis number corresponding to one of the first to sixteenth position switch functions. When the machine coordinate of the corresponding axis is within a parameter-set range, the corresponding position switch signal is output to the PMC.

> **NOTE**
> The setting of 0 means that the position switch function of the number is not used.

6930	**Maximum value of the operating range of the 1-st position switch (PSW101)**
6931	**Maximum value of the operating range of the 2-nd position switch (PSW102)**
	:
6945	**Maximum value of the operating range of the 16-th position switch (PSW116)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the maximum value of the operating range of the first to sixteenth position switches.

NOTE
1 For a diameter-specified axis, use radius values to specify the parameters used to set the maximum and minimum values of an operating range.
2 The position switch function is enabled upon completion of reference position return.

6950	**Minimum value of the operating range of the 1-st position switch (PSW201)**
6951	**Minimum value of the operating range of the 2-nd position switch (PSW202)**
	:
6965	**Minimum value of the operating range of the 16-th position switch (PSW216)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the minimum value of the operating range of the first to sixteenth position switches.

NOTE
1 For a diameter-specified axis, use radius values to specify the parameters used to set the maximum and minimum values of an operating range.
2 The position switch function is enabled upon completion of reference position return.

4.41 PARAMETERS OF MANUAL OPERATION AND AUTOMATIC OPERATION

	#7	#6	#5	#4	#3	#2	#1	#0
7001				JSN		JST	ABS	

[Input type] Parameter input
[Data type] Bit path

 # 1 ABS For the move command after manual intervention in the manual absolute on state:
- 0: Different paths are used in the absolute (G90) and incremental (G91) modes.
- 1: The same path (path in the absolute mode) is used in the absolute (G90) and incremental (G91) modes.

 # 2 JST In manual numerical specification, the STL signal indicating that automatic operation is being started is:
- 0: Not output.
- 1: Output.

 # 4 JSN When an S code is specified with the manual numerical specification function, the modal display of the S code is:
- 0: Not updated.
- 1: Updated.

	#7	#6	#5	#4	#3	#2	#1	#0
7002					JBF	JTF	JSF	JMF

[Input type] Parameter input
[Data type] Bit path

 # 0 JMF In manual numerical specification, M function specification is:
- 0: Allowed.
- 1: Not allowed.

 # 1 JSF In manual numerical specification, S function specification is:
- 0: Allowed.
- 1: Not allowed.

 # 2 JTF In manual numerical specification, T function specification is:
- 0: Allowed.
- 1: Not allowed.

 # 3 JBF In manual numerical specification, B function specification is:
- 0: Allowed.
- 1: Not allowed.

	#7	#6	#5	#4	#3	#2	#1	#0
7010								JMVx

[Input type] Parameter input
[Data type] Bit axis

 # 0 JMVx In manual numerical specification, axis movement specification is:
0: Allowed.
1: Not allowed.

	#7	#6	#5	#4	#3	#2	#1	#0
7040					TRC	RPS	TRS	TRI

[Input type] Parameter input
[Data type] Bit path

 # 0 TRI The G10.6 command for tool retract and return is:
0: Assumed to be an absolute or incremental command according to the absolute or incremental command mode.
1: Always assumed to be an absolute command.

 # 1 TRS After the completion of repositioning in tool retract and return:
0: Automatic operation is restarted.
1: Operation stops when the single block switch is on. When a cycle start is executed again, automatic operation is started.

 # 2 RPS When the tool retract signal TRESC is set to 1 after G10.6 is specified alone:
0: The tool is not retracted.
1: The tool is retracted with the value set for parameter No. 7041 used as the incremental retraction distance.

 # 3 TRC When automatic operation is restarted after the tool retract and return function is executed during the execution of a drilling canned cycle:
0: Machining of the same cycle is performed again (the same drilling is performed).
1: Machining of the next drilling cycle is performed (the next drilling is performed).

7041	Retraction distance in tool retract and return

[Input type] Setting input
[Data type] Real axis
[Unit of data] mm, inch, deg (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the retraction distance used when G10.6 is specified alone for the tool retract and return function. The tool is retracted by the distance set for this parameter in the incremental mode. This data is valid only when bit 2 (RPS) of parameter No. 7040 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
7055					BCG			

[Input type] Parameter input
[Data type] Bit path

 # 3 BCG The bell-shaped acceleration/deceleration time constant change function is:
0: Disabled.
1: Enabled.

7066	Acceleration/deceleration reference speed for the bell-shaped acceleration/deceleration time constant change function

[Input type] Setting input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

This parameter is used when the pre-interpolation bell-shaped acceleration/deceleration time constant change function is used.

4.42 PARAMETERS OF MANUAL HANDLE FEED, HANDLE INTERRUPTION AND HANDLE FEED IN TOOL AXIAL DIRECTION

	#7	#6	#5	#4	#3	#2	#1	#0
7100					HCL		THD	JHD

[Input type] Parameter input
[Data type] Bit path

 # 0 JHD Manual handle feed in JOG feed mode or incremental feed in the manual handle feed
0: Invalid
1: Valid

 # 1 THD In the TEACH IN JOG mode, the manual pulse generator is:
0: Disabled.
1: Enabled.

 # 3 HCL The clearing of handle interruption amount display by soft key [CAN] operation is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
7102								HNGx

[Input type] Parameter input
[Data type] Bit axis

 # 0 HNGx Axis movement direction for rotation direction of manual pulse generator
0: Same in direction
1: Reverse in direction

	#7	#6	#5	#4	#3	#2	#1	#0
7103					HIT	HNT	RTH	

[Input type] Parameter input
[Data type] Bit path

 # 1 RTH By a reset or emergency stop, the amount of manual handle interruption is:
0: Not canceled.
1: Canceled.

 # 2 HNT When compared with the travel distance magnification selected by the manual handle feed travel distance selection signals (incremental feed signals) (MP1, MP2), the travel distance magnification for incremental feed/manual handle feed is:

0: Same.
1: 10 times greater.

 # 3 HIT When compared with the travel distance magnification selected by the manual handle feed travel distance selection signals (incremental feed signals (MP1, MP2), the travel distance magnification for manual handle interrupt is:
0: Same.
1: 10 times greater.

	#7	#6	#5	#4	#3	#2	#1	#0
7105			LBH				HDX	

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 1 HDX Manual handle for I/O Link connection is:
0: Automatically set.
1: Manually set.

> **NOTE**
> For the setting, use parameters Nos. 12300 to 12302.

 # 5 LBH Manual handle feed for the I/O Link β using the I/O link manual pulse generator is:
0: Disabled.
1: Enabled.

7113	Manual handle feed magnification m

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 2000
This parameter sets the magnification m when manual handle feed movement selection signals MP1 and MP2 are set to 0 and 1.

7114	Manual handle feed magnification n

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 2000

This parameter sets the magnification when manual handle feed movement selection signals MP1 and MP2 are set to 1.

7117	Allowable number of pulses that can be accumulated during manual handle feed

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Pulse
[Valid data range] 0 to 999999999

This parameter sets the number of pulses from the manual pulse generator that exceed the rapid traverse rate and can be accumulated without being discarded if manual handle feed faster than the rapid traverse rate is specified.

0:

The feedrate is clamped to the rapid traverse rate. Those handle pulses that exceed the rapid traverse rate are ignored. (The scale reading of the manual pulse generator may not match the travel distance.)

Other than 0:

The feedrate is clamped to the rapid traverse rate. However, those handle pulses that exceed the rapid traverse rate are not ignored. In connection with the manual handle feed travel distance selection signals MP1 and MP2 <G019#4, #5>, the incremental feed amount is determined as described below. (Even if the rotation of the manual pulse generator is stopped, the tool stops after moving by the number of pulses accumulated in the CNC.)

Let m be the magnification based on MP1 and MP2 <G019#4, #5>, and let n be the value set in parameter No. 7117. Then, the manual handle increment feed amount is:

When $n < m$:

Clamped to the value set in parameter No. 7117.

When $n \geq m$:

Clamped to a multiple of the selected magnification.

4.43 PARAMETERS OF REFERENCE POSITION WITH MECHANICAL STOPPER

7181	**First withdrawal distance in reference position setting with mechanical stopper**

7182	**Second withdrawal distance in butt-type reference position setting with mechanical stopper**

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a distance an axis in each cycle operation, along which withdrawal is performed after the mechanical stopper is hit (distance from the mechanical stopper to the withdrawal point).

NOTE
Set the same direction as that set in bit 5 (ZMIx) of parameter No. 1006. Cycle operation cannot be started if the opposite direction is set.

7183	**First butting feedrate in reference position setting with mechanical stopper**

7184	**Second butting feedrate in reference position setting with mechanical stopper**

7185	**Withdrawal feedrate (common to the first and second butting operations) in reference position setting with mechanical stopper**

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets a feedrate used to butt against the stopper along an axis in each cycle.

7186	Torque limit value in butt-type reference position setting with mechanical stopper

[Input type]	Parameter input
[Data type]	Byte axis
[Unit of data]	%
[Valid data range]	0 to 100

This parameter sets a torque limit value.

NOTE
When 0 is set in this parameter, 100% is assumed.

4.44 PARAMETERS OF SOFTWARE OPERATOR'S PANEL

	#7	#6	#5	#4	#3	#2	#1	#0
7200		OP7	OP6	OP5	OP4	OP3	OP2	OP1

[Input type] Parameter input
[Data type] Bit path

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 OP1 Mode selection on software operator's panel
0: Not performed
1: Performed

 # 1 OP2 JOG feed axis select and manual rapid traverse select on software operator's panel
0: Not performed
1: Performed

 # 2 OP3 Manual pulse generator's axis select and manual pulse generator's magnification select on software operator's panel
0: Not performed
1: Performed

 # 3 OP4 JOG feedrate override select, feedrate override select, and rapid traverse override select on software operator's panel
0: Not performed
1: Performed

 # 4 OP5 Optional block skip select, single block select, machine lock select, and dry run select on software operator's panel
0: Not performed
1: Performed

 # 5 OP6 Protect key on software operator's panel
0: Not performed
1: Performed

 # 6 OP7 Feed hold on software operator's panel
0: Not performed
1: Performed

	#7	#6	#5	#4	#3	#2	#1	#0
7201								JPC

[Input type] Parameter input
[Data type] Bit path

 # 0 JPC For the name of a general-purpose switch function on the software operator's panel, the use of full-size characters is:
0: Not allowed.
1: Allowed.

7210	**Job-movement axis and its direction on software operator's panel "↑"**
7211	**Job-movement axis and its direction on software operator's panel "↓"**
7212	**Job-movement axis and its direction on software operator's panel "→"**
7213	**Job-movement axis and its direction on software operator's panel "←"**
7214	**Job-movement axis and its direction on software operator's panel "⇙"**
7215	**Job-movement axis and its direction on software operator's panel "⇗"**
7216	**Job-movement axis and its direction on software operator's panel "⤴"**
7217	**Job-movement axis and its direction on software operator's panel "↱"**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 8

On software operator's panel, set a feed axis corresponding to an arrow key on the MDI panel when jog feed is performed.

Setting value	Feed axis and direction
0	Not moved
1	First axis, positive direction
2	First axis, negative direction
3	Second axis, positive direction
4	Second axis, negative direction
5	Third axis, positive direction
6	Third axis, negative direction
7	Fourth axis, positive direction
8	Fourth axis, negative direction

Example)

Under X, Y, and Z axis configuration, to set arrow keys to feed the axes in the direction specified as follows, set the parameters to the values given below. [8↑] to the positive direction of the Z axis, [2↓] to the negative direction of the Z axis, [6→] to the positive direction of the X axis [4←] to the negative direction of the X axis, [1⇙] to the positive direction of the Y axis, [9⇗] to the negative direction of the Y axis

Parameter No.7210 = 5 (Z axis, positive direction)
Parameter No.7211 = 6 (Z axis, negative direction)
Parameter No.7212 = 1 (X axis, positive direction)
Parameter No.7213 = 2 (X axis, negative direction)
Parameter No.7214 = 3 (Y axis, positive direction)
Parameter No.7215 = 4 (Y axis, negative direction)
Parameter No.7216 = 0 (Not used)
Parameter No.7217 = 0 (Not used)

7220	**Name of general-purpose switch 1 on software operator's panel (first character)**
to	**to**
7283	**Name of general-purpose switch 8 on software operator's panel (eighth character)**

7284	**Name of general-purpose switch 9 on software operator's panel (first character)**
to	**to**
7299	**Name of general-purpose switch 10 on software operator's panel (eighth character)**

7352	**Name of general-purpose switch 11 on software operator's panel (first character)**
to	**to**
7399	**Name of general-purpose switch 16 on software operator's panel (eighth character)**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] -128 to 127

Each of these parameters sets the name of a general-purpose switch on the software operator's panel with character codes indicated in the character-code correspondence table. A switch name consists of up to eight characters.

Parameter Nos. 7220 to 7227 : Name of general-purpose switch 1
Parameter Nos. 7228 to 7235 : Name of general-purpose switch 2
Parameter Nos. 7236 to 7243 : Name of general-purpose switch 3
Parameter Nos. 7244 to 7251 : Name of general-purpose switch 4
Parameter Nos. 7252 to 7259 : Name of general-purpose switch 5
Parameter Nos. 7260 to 7267 : Name of general-purpose switch 6
Parameter Nos. 7268 to 7275 : Name of general-purpose switch 7
Parameter Nos. 7276 to 7283 : Name of general-purpose switch 8
Parameter Nos. 7284 to 7291 : Name of general-purpose switch 9
Parameter Nos. 7292 to 7299 : Name of general-purpose switch 10
Parameter Nos. 7352 to 7359 : Name of general-purpose switch 11
Parameter Nos. 7360 to 7367 : Name of general-purpose switch 12
Parameter Nos. 7368 to 7375 : Name of general-purpose switch 13
Parameter Nos. 7376 to 7383 : Name of general-purpose switch 14
Parameter Nos. 7384 to 7391 : Name of general-purpose switch 15
Parameter Nos. 7392 to 7399 : Name of general-purpose switch 16

Character code list

Character	Code	Character	Code	Character	Code
A	65	Q	81	6	54
B	66	R	82	7	55
C	67	S	83	8	56
D	68	T	84	9	57
E	69	U	85		32
F	70	V	86	!	33
G	71	W	87	“	34
H	72	X	88	#	35
I	73	Y	89	$	36
J	74	Z	90	%	37
K	75	0	48	&	38
L	76	1	49	‘	39
M	77	2	50	(	40
N	78	3	51	)	41
O	79	4	52	*	42
P	80	5	53	+	43

4.45 PARAMETERS OF PROGRAM RESTART

	#7	#6	#5	#4	#3	#2	#1	#0
7300	MOU	MOA						

[Input type] Parameter input
[Data type] Bit path

 # 6 MOA In program restart operation, before movement to a machining restart point:
0: The last M, S, T, and B codes are output.
1: All M codes and the last S, T, and B codes are output.
This parameter is enabled when the MOU parameter is set to 1.

 # 7 MOU In program restart operation, before movement to a machining restart point after restart block search:
0: The M, S, T, and B codes are not output.
1: The last M, S, T, and B codes are output.

	#7	#6	#5	#4	#3	#2	#1	#0
7301								ROF

[Input type] Parameter input
[Data type] Bit path

 # 0 ROF When the coordinates for restarting are displayed on the program restart screen:
0: Tool length compensation (M series), tool position compensation (T series), cutter compensation (M series), and tool-nose radius compensation (T series) are considered.
1: Whether these compensation values are considered depends on the settings of bits 7 and 6 of parameter No. 3104 and bit 1 of parameter No. 3129 (parameters for specifying whether to consider each compensation value).

7310	Ordinal number of an axis along which a movement is made in dry run after program restart

[Input type] Setting input
[Data type] Byte axis
[Valid data range] 1 to (Number of controlled axes)
This parameter sets the ordinal number of an axis along which a movement is made in dry run after the program is restarted.

4.46 PARAMETERS OF ROTARY TABLE DYNAMIC FIXTURE OFFSET

	#7	#6	#5	#4	#3	#2	#1	#0
7570					CFA			FTP

[Input type] Parameter input
[Data type] Bit path

 # 0 FTP Fixture offset type setting
0: Movement type
(The tool moves when the fixture offset changes.)
1: Shift type
(The tool does not move when the fixture offset changes.)

 # 3 CFA When the fixture offset function is used, and a rotation axis is specified in the increment mode (G91 mode) after manual intervention in the state where the manual absolute switch is on:
0: A vector calculation is made using coordinates not reflecting a manual intervention amount.
1: A vector calculation is made using coordinates reflecting a manual intervention amount.

	#7	#6	#5	#4	#3	#2	#1	#0
7575								
								FAX

[Input type] Parameter input
[Data type] Bit axis

 # 0 FAX Fixture offset on each axis is:
0: Disabled.
1: Enabled.

7580	Rotation axis for fixture offset (first group)

7581	Linear axis 1 for fixture offset (first group)

7582	Linear axis 2 for fixture offset (first group)

7583	Rotation axis for fixture offset (second group)

7584	Linear axis 1 for fixture offset (second group)

7585	Linear axis 2 for fixture offset (second group)

7586	Rotation axis for fixture offset (third group)

7587	Linear axis 1 for fixture offset (third group)

7588	Linear axis 2 for fixture offset (third group)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

These parameters specify rotation axes for fixture offset and pairs of linear axes for selecting a rotation plane. Specify a pair of linear axes so that rotation from the positive direction of linear axis 1 to the positive direction is in the normal direction of the rotation axis.

Up to three groups of a rotation axis setting and two linear axis settings can be specified. The fixture offset value is calculated first for the rotation axis in the first group. Then, for the second and third groups, the fixture value is sequentially calculated using the previous calculation result. When you do not need the third group, set 0 for the rotation axis.

4.47 PARAMETERS OF POLYGON TURNING

	#7	#6	#5	#4	#3	#2	#1	#0
7600	PLZ							PFF

[Input type] Parameter input
[Data type] Bit path

 # 0 PFF In spindle-servo polygon turning, feed forward for the tool rotation axis (servo axis) during polygon turning is always:
0: Disabled.
1: Enabled.

 # 7 PLZ Reference position return based on a G28 command on the tool rotation axis for polygon turning is:
0: Performed in the same sequence as manual reference position return.
1: Performed by positioning using the rapid traverse rate.
The synchronous axis returns to the reference position in the same sequence as the manual reference position return when no return-to-reference position is performed after the power is turned on.

	#7	#6	#5	#4	#3	#2	#1	#0
7602			COF	HST	HSL	HDR	SNG	MNG

[Input type] Parameter input
[Data type] Bit path

 # 0 MNG The rotational direction of the master axis in the spindle-spindle polygon turning mode is:
0: Not reversed.
1: Reversed.

 # 1 SNG The rotational direction of the polygon synchronization axis in the spindle-spindle polygon turning mode is:
0: Not reversed.
1: Reversed.

 # 2 HDR When phase control is exercised in spindle-spindle polygon turning mode (parameter COF(No.7602#5) is set to 0), the phase shift direction is:
0: Not reversed for phase synchronization.
1: Reversed for phase synchronization.

> **NOTE**
> The rotation directions and phase shift directions of the master axis and polygon synchronization axis in the spindle-spindle polygon turning mode can be reversed with a programmed command. MNG, SNG, and HDR are used to reverse an actual direction relative to the programmed command.

 # 3 HSL When phase control is exercised in spindle-spindle polygon turning mode (parameter COF(No.7602#5) is set to 0), this parameter selects the spindle that is subject to a phase shift operation for phase synchronization:

0: The polygon synchronization axis is selected.
1: The master axis is selected.

> **NOTE**
> 1 Select an axis to which a phase shift command is applied.
> 2 Spindle operation for phase synchronization is performed with both spindles.

 # 4 HST When phase control is applied in spindle-spindle polygon turning mode (parameter COF(No.7602#5) is set to 0), and spindle-spindle polygon turning mode is specified:

0: Spindle-spindle polygon turning mode is entered with the current spindle speed maintained.
1: Spindle-spindle polygon turning mode is entered after the spindle is stopped.

> **NOTE**
> This parameter can be used, for example, when single-rotation signal detection cannot be guaranteed at an arbitrary feedrate because a separate detector is installed to detect the spindle single-rotation signal, as when a built-in spindle is used. (When bit 7 of parameter No.4016 for the serial spindle is set to 1, together with this parameter, a single-rotation signal detection position in spindle-spindle polygon turning mode is guaranteed.)

 # 5 COF In spindle-spindle polygon turning mode, phase control is:

0: Enabled.
1: Disabled.

> **NOTE**
> When the use of phase control is not selected, the steady state is reached in a shorter time because phase synchronization control is not applied. Once steady rotation is achieved, however, polygonal turning must be completed without changing the steady state. (If a spindle speed change including a spindle stop is made, a phase shift occurs, so that polygon turning is not performed normally.) Even when this parameter is set to 1, an R command (phase position command) in a block containing G51.2 is ignored ; no alarm is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
7603	PST		RDG		PLROT	SBR	QDR	RPL

[Input type] Parameter input
[Data type] Bit path

 # 0 RPL Upon reset, spindle-spindle polygon turning mode is:
0: Released.
1: Not released.

 # 1 QDR The rotational direction of the polygon synchronization axis:
0: Depends on the sign (+/*) of a specified value for Q.
1: Depends on the rotational direction of the first spindle.
If a negative value is specified for Q when QDR = 1, the alarm (PS0218) is issued.

 # 2 SBR For spindle synchronization, speed ratio control is:
0: Not used.
1: Used.

 # 3 PLROT The machine coordinates of a tool rotation axis for polygon turning are:
0: Rounded by the setting in parameter 7620.
1: Rounded by 360° (or the setting in parameter No. 1260 when bit 0 (ROA) of parameter No. 1008 is set to 1).

 # 5 RDG On the diagnosis screen No.476, for spindle-spindle polygon phase command value (R), displays:
0: The specified value (in the increment system for the rotation axis).
1: The actual number of shift pulses.

> **NOTE**
> A phase command is specified in address R, in units of degrees. For control, the actual shift amount is converted to a number of pulses according to the conversion formula: 360 degrees = 4096 pulses. This parameter switches the display of a specified value to that of a converted value.

 # 7 PST The polygon spindle stop signal *PLSST <Gn038.0>is:
0: Not used.
1: Used.

7610	Control axis number of tool rotation axis for polygon turning

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

This parameter sets the control axis number of a rotation tool axis used for polygon turning.
However, when a G51.2 command is executed by setting 0 in this parameter, operation stops with the alarm (PS0314).

7620	Movement of tool rotation axis per revolution for polygon turning

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the movement of a tool rotation axis per revolution.

7621	Maximum allowable speed for the tool rotation axis for polygon turning

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] min^{-1}
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the maximum allowable speed of the tool rotation axis.

> **NOTE**
> If the speed of the tool rotation axis exceeds the set maximum allowable speed during polygon turning, the synchronization between the spindle and tool rotation axis is lost, and operation stops with alarm PS5018.

7631	Allowable spindle speed deviation level in spindle-spindle polygon turning

[Input type] Parameter input
[Data type] Word path
[Unit of data] min^{-1}
[Valid data range] 0 to 99999999

This parameter sets the allowable level of deviation between the actual speed and specified speed of each spindle in spindle-spindle polygon turning. The value set with this parameter is used for both the master axis and polygon synchronization axis.
When 0 is set in this parameter, the specification of 8 [min^{-1}] is assumed.

7632	Steady state confirmation time duration in spindle polygon turning

[Input type] Parameter input
[Data type] Word path
[Unit of data] msec
[Valid data range] 0 to 32767

This parameter sets the duration required to confirm that both spindles have reached their specified speeds in spindle-spindle polygon turning.
If the state where the speed of each spindle is within the range set with parameter No.7631, and has lasted at least for the duration specified with parameter No.7632, the spindle polygon speed arrival signal PSAR <Fn063.2> is set to 1.
When 0 is set in this parameter, the specification of 64 [msec] is assumed.

7635	Ratio of slave spindle speed in spindle synchronization control

[Input type] Parameter input
[Data type] Byte spindle
[Valid data range] 0 to 9

This parameter sets the ratio of master spindle speed:slave spindle speed (1:n) in spindle synchronization control.

> **NOTE**
> This parameter is valid only when bit 2 (SBR) of parameter No. 7603 is set to 1.

7636	Maximum allowable slave spindle speed in spindle synchronization control

[Input type] Parameter input
[Data type] Word spindle
[Unit of data] min^{-1}
[Valid data range] 0 to 19999

The speed of the slave spindle under speed ratio control in spindle synchronization control is clamped so that the speed does not exceed the value set in this parameter.

> **NOTE**
> 1 This parameter is valid only when bit 2 (SBR) of parameter No. 7603 is set to 1.
> 2 When speed ratio control in spindle synchronization control is used, be sure to set this parameter.
> When 0 is set, the speed is clamped to 0, disabling rotation under spindle synchronization.

7640	Master axis in spindle-spindle polygon turning

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Maximum number of controlled axes (Within a path)

This parameter sets the master axis in spindle-spindle polygon turning.

NOTE

1. Spindle-spindle polygon turning is enabled only for serial spindles.
2. When any one of parameter No. 7640 and No. 7641 is set to 0, polygon turning is performed using the first spindle (master axis) and the second spindle (polygon synchronous axis) in the path to which the parameter belongs.
3. When a spindle other than the first serial spindle is used as a master axis, the multi-spindle control option is required to specify an S command for the master axis.
4. When the PMC window function or G10 command is used to rewrite this parameter, rewrite this parameter before the block specifying the spindle-spindle polygon command G51.2. When the PMC window function is used to rewrite this parameter in the block immediately before G51.2, specify the rewriting of this parameter by using an M code (parameter No. 3411 and up) without buffering.

7641	Polygon synchronous axis in spindle-spindle polygon turning

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Maximum number of controlled axes (Within a path)

This parameter sets the polygon synchronous (slave) axis in spindle-spindle polygon turning.

NOTE

1. Spindle-spindle polygon turning is enabled only for serial spindles.
2. When any one of parameter No. 7640 and No. 7641 is set to 0, polygon turning is performed using the first spindle (master axis) and the second spindle (polygon synchronous axis) in the path to which the parameter belongs.
3. When a spindle other than the first serial spindle is used as a master axis, the multi-spindle control option is required to specify an S command for the master axis.
4. When the PMC window function or G10 command is used to rewrite this parameter, rewrite this parameter before the block specifying the spindle-spindle polygon command G51.2. When the PMC window function is used to rewrite this parameter in the block immediately before G51.2, specify the rewriting of this parameter by using an M code (parameter No. 3411 and up) without buffering.

7642	Master axis in spindle-spindle polygon turning (spindle number common to the system)

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Maximum number of controlled axes (Common to the system)

This parameter sets the master axis in spindle-spindle polygon turning.

NOTE

1 Spindle-spindle polygon turning is enabled only for serial spindles.
2 This parameter is invalid if either parameter No. 7642 or No.7643 is set to 0. In this case, the settings of parameter No. 7640 and No.7641 are valid.
3 When a spindle other than the first serial spindle is used as a master axis, the multi-spindle control option is required to specify an S command for the master axis.
4 When the PMC window function or G10 command is used to rewrite this parameter, rewrite this parameter before the block specifying the spindle-spindle polygon command G51.2. When the PMC window function is used to rewrite this parameter in the block immediately before G51.2, specify the rewriting of this parameter by using an M code (parameter No. 3411 and up) without buffering.
5 A spindle number common to the system is to be set in this parameter. When using this parameter, set 0 in parameter No. 7640 and No. 7641.

7643	Polygon synchronous axis in spindle-spindle polygon turning

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Maximum number of controlled axes (Common to the system)

This parameter sets the polygon synchronous (slave) axis in spindle-spindle polygon turning.

NOTE

1. Spindle-spindle polygon turning is enabled only for serial spindles.
2. This parameter is invalid if either parameter No. 7642 or No.7643 is set to 0. In this case, the settings of parameter No. 7640 and No.7641 are valid.
3. When a spindle other than the first serial spindle is used as a master axis, the multi-spindle control option is required to specify an S command for the master axis.
4. When the PMC window function or G10 command is used to rewrite this parameter, rewrite this parameter before the block specifying the spindle-spindle polygon command G51.2. When the PMC window function is used to rewrite this parameter in the block immediately before G51.2, specify the rewriting of this parameter by using an M code (parameter No. 3411 and up) without buffering.
5. A spindle number common to the system is to be set in this parameter. When using this parameter, set 0 in parameter No. 7640 and No. 7641.

4.48 PARAMETERS OF THE ELECTRIC GEAR BOX (EGB)

	#7	#6	#5	#4	#3	#2	#1	#0
7700						HDR		HBR

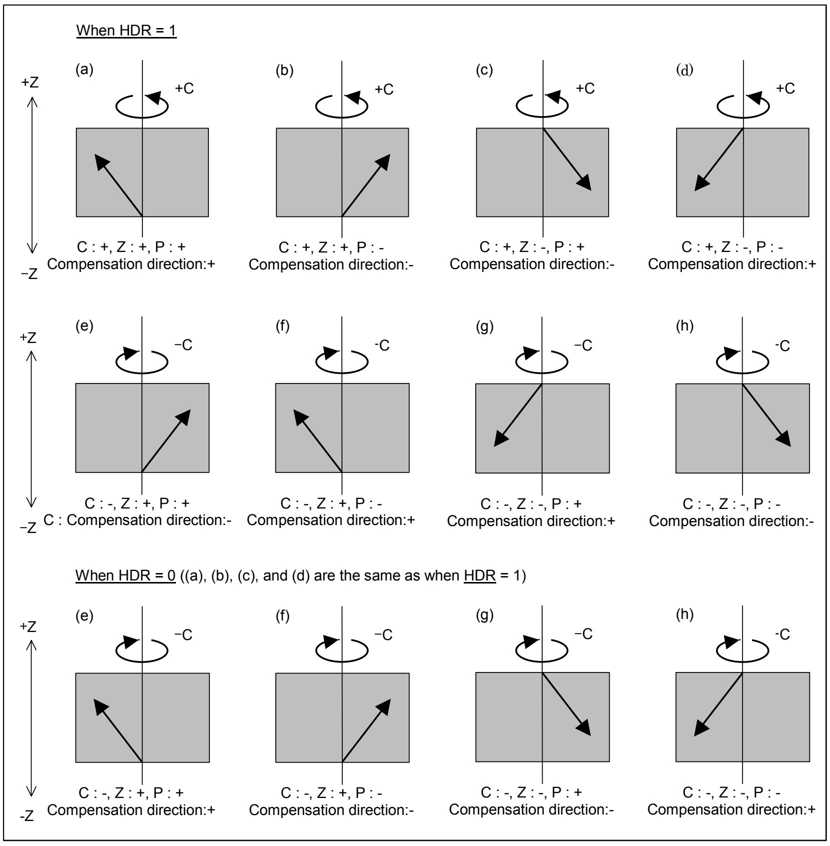
[Input type] Parameter input
[Data type] Bit path

 # 0 HBR When the electric gear box (EGB) function is used, performing a reset:

0: Cancels the synchronous mode (G81 or G81.5).
1: Does not cancel the synchronous mode. The mode is canceled only by the G80 or G80.5 command.

 # 2 HDR Direction for compensation for a helical gear (usually, set 1.)
(Example) To cut a left-twisted herical gear when the direction of rotation about the C-axis is the negative (-) direction:

0: Set a negative (-) value in P.
1: Set a positive (+) value in P.



	#7	#6	#5	#4	#3	#2	#1	#0
7701					LZR			

[Input type] Parameter input
[Data type] Bit path

 # 3 LZR When L (number of hob threads) = 0 is specified at the start of EGB synchronization (G81):
0: Synchronization is started, assuming that L = 1 is specified.
1: Synchronization is not started, assuming that L = 0 is specified. However, helical gear compensation is performed.

	#7	#6	#5	#4	#3	#2	#1	#0
7702	PHD	PHS			ART			TDP

[Input type] Parameter input
[Data type] Bit path

 # 0 TDP The specifiable number of teeth, T, of the electric gear box (G81) is:
0: 1 to 1000
1: 0.1 to 100 (1/10 of a specified value)

NOTE
In either case, a value from 1 to 1000 can be specified.

 # 3 ART The retract function executed when a servo spindle alarm is issued is:
0: Disabled.
1: Enabled.

 # 6 PHS When the G81/G80 block contains no R command:
0: Acceleration/deceleration is not performed at the start or cancellation of EGB synchronization.
1: Acceleration/deceleration is performed at the start or cancellation of EGB synchronization. After acceleration at the start of synchronization, phase synchronization is automatically performed.

 # 7 PHD The direction of movement for automatic phase synchronization is:
0: Positive (+).
1: Negative (-).

	#7	#6	#5	#4	#3	#2	#1	#0
7703						ARO	ARE	ERV

[Input type] Parameter input
[Data type] Bit path

 # 0 ERV During EGB synchronization (G81), feed per revolution is performed for:
0: Feedback pulses.
1: Pulses converted to the speed for the workpiece axis.

 # 1 ARE The retract function executed when a servo spindle alarm is issued retracts the tool during:
0: EGB synchronization or automatic operation (automatic operation signal OP = 1).
1: EGB synchronization.

 # 2 ARO The retract function executed when a servo spindle alarm is issued retracts the tool during:
0: EGB synchronization.
1: EGB synchronization and automatic operation (automatic operation signal OP = 1).

The following table lists the parameter settings and corresponding operation.

ARE	ARO	Operation
1	0	During EGB synchronization
1	1	During EGB synchronization and automatic operation
0	0	During EGB synchronization or automatic operation
0	1	

NOTE
1 Parameters ARE and ARO are valid when bit 3 (ART) of parameter No. 7702 is set to 1 (when the retract function executed when a servo spindle alarm is issued is enabled).
2 This parameter is valid when bit 1 (ARE) of parameter No. 7703 is set to 1.

7709	Number of the axial feed axis for helical compensation

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to Number of controlled axes
This parameter sets the number of the axial feed axis for a helical gear.

> **NOTE**
> When this parameter is set to 0 or a value outside the valid setting range, the Z-axis is used as the axial feed axis.
> When there are two or more Z-axes in parallel, use this parameter to specify the axis to be used as the axial feed axis.

7710	Axis number of an axis to be synchronized using the method of command specification for a hobbing machine

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to Number of controlled axes

When there are several groups of axes to be synchronized (the axes for which bit 0 (SYNMOD) of parameter No. 2011 is set to 1), an axis for which to start synchronization is specified using the following command (for a hobbing machine):

G81 T t L ± *l* ;

t: Spindle speed $(1 \leq t \leq 1000)$
l: Number of synchronized axis rotations $(1 \leq l \leq 21)$

Synchronization between the spindle and a specified axis is established with the ratio of ±*l* rotations about the synchronized axis to t spindle rotations.
t and *l* correspond to the number of teeth and the number of threads on the hobbing machine, respectively.
When there are several groups of axes to be synchronized and the above command is issued without setting this parameter, the alarm (PS1593) is issued.
When only one group of axes is to be synchronized, this parameter is ignored.

7717	Synchronization cancellation delay time for an EGB axis

[Input type] Parameter input
[Data type] Word axis
[Unit of data] 0.1sec
[Valid data range] 0 to 32767 (0 to 3276.7sec)

If a servo alarm is issued during EGB synchronization, the tool may be retracted due to the servo alarm. At this time, when the tool has been retracted along the specified axes and the time set in this parameter has elapsed after the servo alarm is issued, EGB axis synchronization is canceled.
This parameter is also valid when a servo alarm is issued for an axis along which to retract the tool.
When this parameter is set, the output of the retract completion signal RTRCTF is also delayed.

NOTE
Servo position control including EGB axis synchronization stops 400 ms after the output of the retract completion signal RTRCTF.
This parameter is invalid in either of the following cases:
1) When a servo alarm is issued for an axis for which EGB synchronization is performed
2) When excitation is cut for an axis sharing the same amplifier with the axis for which EGB synchronization is performed due to a servo alarm

	#7	#6	#5	#4	#3	#2	#1	#0
7731					ECN		EHF	EFX

[Input type] Parameter input
[Data type] Bit path

 # 0 EFX As the EGB command:
0: G80 and G81 are used.
1: G80.8 and G81.8 are used.

NOTE
When this parameter is set to 0, no drilling canned cycle can be used.

 # 1 EHF Feed-forward control for the axial feed axis for helical compensation is:
0: Enabled only during cutting.
1: Always enabled in the G81 synchronous mode.
Usually, set 0.
Feed-forward control is usually enabled in the cutting feed mode. When this parameter is set to 1, feed-forward control is always enabled for the axial feed axis for helical compensation during synchronization by the command (G81) for a hobbing machine.
When bit 3 (FFR) of parameter No. 1800 is set to 1, feed-forward control is always enabled regardless of the setting of this parameter.

 # 3 ECN When the automatic phase synchronization function for the electric gear box is disabled, during EGB synchronization, the G81 or G81.5 command:
0: Cannot be issued again. (The alarm (PS1595) is issued.)
1: Can be issued again.

7740	Feedrate during retraction

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets the feedrate during retraction for each axis.

7741	Retracted distance

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the retracted distance for each axis.

7772	Number of position detector pulses per rotation about the tool axis

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 999999999

This parameter sets the number of pulses per rotaiton about the tool axis (on the spindle side), for the position detector.

For an A/B phase detector, set this parameter with four pulses equaling one A/B phase cycle.

7773	Number of position detector pulses per rotation about the workpiece axis

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 999999999

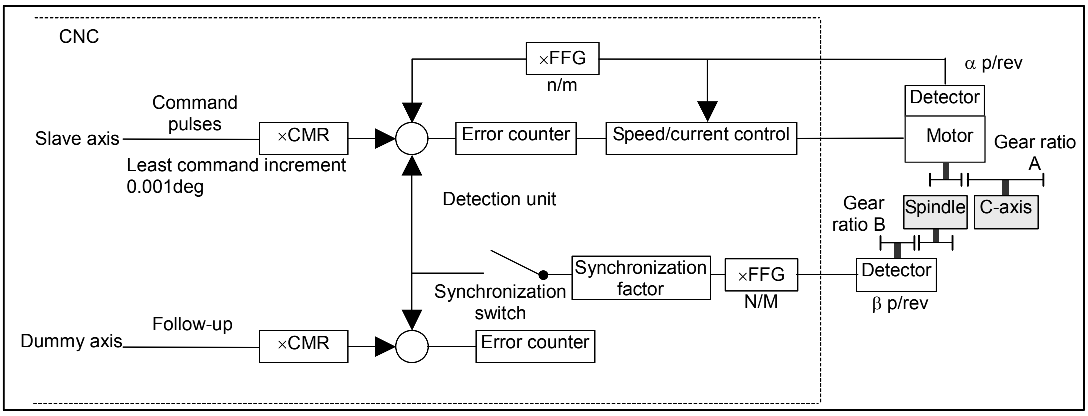
This parameter sets the number of pulses per rotation about the workpiece axis (on the slave side), for the position detector.

Set the number of pulses output by the detection unit.

Set parameters Nos. 7772 and 7773 when using the G81 EGB synchronization command.

(Example 1)

When the EGB master axis is the spindle and the EGB slave axis is the C-axis



Gear ratio of the spindle to the detector B:
1/1 (The spindle and detector are directly connected to each other.)

Number of detector pulses per spindle rotation β: 80,000 pulses/rev
(Calculated for four pulses for one A/B phase cycle)

FFG N/M of the EGB dummy axis: 1/1

Gear ratio of the C-axis A: 1/36 (One rotation about the C-axis to 36 motor rotations)

Number of detector pulses per C-axis rotation α: 1,000,000 pulses/rev

C-axis CMR: 1

C-axis FFG n/m: 1/100

In this case, the number of pulses per spindle rotation is:
$80000 \times 1/1 = 80000$
Therefore, set 80000 for parameter No. 7772.
The number of pulses per C-axis rotation in the detection unit is:
$1000000 \div 1/36 \times 1/100 = 360000$
Therefore, set 360000 for parameter No. 7773.

(Example 2)
When the gear ratio of the spindle to the detector B is 2/3 for the above example (When the detector rotates twice for three spindle rotations)
In this case, the number of pulses per spindle rotation is:

$$80000 \times \frac{2}{3} = \frac{160000}{3}$$

160000 cannot be divided by 3 without a remainder. In this case, change the setting of parameter No. 7773 so that the ratio of the settings of parameters Nos. 7772 and 7773 indicates the value you want to set.

$$\frac{\text{No.5996}}{\text{No.5997}} = \frac{160000/3}{360000} = \frac{160000}{360000 \times 3} = \frac{160000}{1080000}$$

Therefore, set 160000 for parameter No. 7772 and 1080000 for parameter No. 7773.
As described above, all the settings of parameters Nos. 7772 and 7773 have to do is to indicate the ratio correctly. So, you can reduce the fraction indicated by the settings. For example, you may set 16 for parameter No. 7772 and 108 for parameter No. 7773 for this example.

7776	Feedrate during automatic phase synchronization for the workpiece axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg/min
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets the feedrate during automatic phase synchronization for the workpiece axis.

When this parameter is set to 0, the rapid traverse rate (parameter No. 1420) is used as the feedrate during automatic phase synchronization.

7777	Angle shifted from the spindle position (one-rotation signal position) the workpiece axis uses as the reference of phase synchronization

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the angle shifted from the spindle position (one-rotation signal position) the workpiece axis uses as the reference of phase synchronization.

7778	Acceleration for acceleration/deceleration for the workpiece axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg/sec/sec
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(For a millimeter machine, 0.0 to +100000.0, for an inch machine, 0.0 to +10000.0)

This parameter sets an acceleration for acceleration/deceleration for the workpiece axis.

7782	Number of pulses from the position detector per EGB master axis rotation

[Input type] Parameter input
[Data type] 2-word axis
[Valid data range] 1 to 999999999

This parameter sets the number of pulses from the position detector per EGB master axis rotation.

For an A/B phase detector, set this parameter with four pulses equaling one A/B phase cycle.

7783	Number of pulses from the position detector per EGB slave axis rotation

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 1 to 999999999

This parameter sets the number of pulses from the position detector per EGB slave axis rotation.
Set the number of pulses output by the detection unit.
Set this parameter when using the G81.5 EGB synchronization command.
The method for setting parameters Nos. 7782 and 7783 is the same as for parameters Nos. 7772 and 7773. For the method, see the description of parameters Nos. 7772 and 7773.

The ratio of the number of pulses for the master slave to that of pulses for the slave axis may be valid, but the settings of the parameters may not indicate the actual number of pulses. For example, the number of pulses may not be able to be divided without a remainder for the reason of the master and slave axis gear ratios as described in example 2. In this case, the following methods cannot be used for the G81.5 command:

G81.5 T__ C__ ; When the speed is specified for the master axis and the travel distance is specified for the slave axis
G81.5 P__ C0 L__ ; When the number of pulses is specified for the master axis and the speed is specified for the slave axis

4.49 PARAMETERS OF AXIS CONTROL BY PMC

	#7	#6	#5	#4	#3	#2	#1	#0
8001	SKE	AUX	NCC		RDE	OVE		MLE

[Input type] Parameter input
[Data type] Bit path

 # 0 MLE Whether all axis machine lock signal MLK is valid for PMC-controlled axes
0: Valid
1: Invalid
The axis-by-axis machine lock signal MLKx depends on the setting of bit 1 of parameter No. 8006.

 # 2 OVE Signals related to dry run and override used in PMC axis control
0: Same signals as those used for the CNC
1: Signals specific to the PMC
The signals used depend on the settings of these parameter bits as indicated below.

Signals	No.8001#2=0 (same signals as those used for the CNC)		No.8001#2=1 (signals specific to the PMC)	
Feedrate override signals	*FV0to*FV7	G012	*EFV0to*EFV7	G151
Override cancellation signal	OVC	G006#4	EOVC	G150#5
Rapid traverse override signals	ROV1,2	G014#0,1	EROV1,2	G150#0,1
Dry run signal	DRN	G46#7	EDRN	G150#7
Rapid traverse selection signal	RT	G19#7	ERT	G150#6

(The signal addresses at PMC selection time are for the first group.)

 # 3 RDE Whether dry run is valid for rapid traverse in PMC axis control
0: Invalid
1: Valid

 # 5 NCC When the program specifies a move command for a PMC-controlled axis (with the controlled axis selection signal *EAX set to 1) not placed under PMC axis control:
0: CNC command is valid.
1: The alarm (PS0130) is issued.

 # 6 AUX In PMC axis control, the auxiliary function command (12H) output size is:
0: 1 byte (0 to 255)
1: 2 bytes (0 to 65535)

 # 7 SKE Skip signal during axis control by the PMC
0: Uses the same signal SKIP <X004#7, X013#7, or X011#7> as CNC.
1: Uses dedicated axis control signal ESKIP <X004#6, X013#6, or X011#6> used by the PMC.

	#7	#6	#5	#4	#3	#2	#1	#0
8002	FR2	FR1	PF2	PF1	F10		DWE	RPD

[Input type] Parameter input
[Data type] Bit path

 # 0 RPD Rapid traverse rate for PMC-controlled axes
0: Feedrate specified with parameter No.1420
1: Feedrate specified with the feedrate data in an axis control command by PMC

 # 1 DWE Minimum time which can be specified in a dwell command in PMC axis control when the increment system is IS-C
0: 1ms
1: 0.1ms

 # 3 F10 Least increment for the feedrate for cutting feed (per minute) in PMC axis control
The following settings are applied when bit 4 (PF1) of parameter No. 8002 is set to 0 and bit 5 (PF2) of parameter No. 8002 is set to 0.

	F10	IS-A	IS-B	IS-C	IS-D	IS-E
Millimeter input (mm/min)	0	10	1	0.1	0.01	0.001
	1	100	10	1	0.1	0.01
Inch input (inch/min)	0	0.1	0.01	0.001	0.0001	0.00001
	1	1	0.1	0.01	0.001	0.0001

 # 4 PF1
 # 5 PF2 Set the feedrate unit of cutting feedrate (feed per minute) for an axis controlled by the PMC.

P8002#5 PF2	P8002#4 PF1	Feedrate unit
0	0	1 / 1
0	1	1 / 10
1	0	1 / 100
1	1	1 / 1000

 # 6 FR1
 # 7 FR2 Set the feedrate unit for cutting feedrate (feed per rotation) for an axis controlled by the PMC.

P8002#7 FR2	P8002#6 FR1	Millimeter input (mm/rev)	Inch input (inch/rev)
0	0	0.0001	0.000001
1	1		
0	1	0.001	0.00001
1	0	0.01	0.0001

	#7	#6	#5	#4	#3	#2	#1	#0
8004		NCI	DSL			JFM	NMT	CMV

[Input type] Parameter input
[Data type] Bit path

 # 0 CMV If an axis control command based on PMC axis control is specified for the same axis when the CNC specifies a move command and auxiliary function, and the auxiliary function completion signal is awaited after a movement made on the specified axis:

0: The alarm (PS0130) is issued.

1: The axis control command based on PMC axis control is executed.

 # 1 NMT When a command is specified from the CNC for the axis on which the tool is moving according to axis control specification from the PMC:

0: An alarm PS0130 is issued.

1: The command is executed without issuing an alarm, provided the command does not involve a movement on the axis.

 # 2 JFM This parameter sets the units used to specify feedrate data when continuous feed is specified in axis control by the PMC.

Increment system	P8004#2 (JFM)	Millimeter input (mm/min)	Inch input (inch/min)	Rotation axis (rpm)
IS-B	0	1	0.01	0.00023
	1	200	2.00	0.046
IS-C	0	0.1	0.001	0.000023
	1	20	0.200	0.0046

 # 5 DSL If the selection of an axis is changed when PMC axis selection is disabled:

0: An alarm PS0139 is issued.

1: The change is valid, and no alarm is issued for an unspecified group.

 # 6 NCI In axis control by the PMC, a position check at the time of deceleration is:

0: Performed.

1: Not performed.

	#7	#6	#5	#4	#3	#2	#1	#0
8005			IFV		DRR	R10	CDI	EDC

[Input type] Setting input
[Data type] Bit path

 # 0 EDC In axis control by the PMC, an external deceleration function is:

0: Disabled.

1: Enabled.

 # 1 CDI In axis control by the PMC, when diameter programming is specified for a PMC-controlled axis:

0: The amount of travel and feedrate are each specified with a radius.

1: The amount of travel is specified with a diameter while the feedrate is specified with a radius.

This parameter is valid when bit 3 (DIA) of parameter No.1006 is set to 1 (A move command for each axis is based on diameter specification.)

 # 2 R10 When the parameter RPD (bit 0 of parameter No.8002) is set to 1, the unit for specifying a rapid traverse rate for the PMC axis is:
0: 1 mm/min.
1: 10mm/min.

 # 3 DRR For cutting feed per rotation in PMC axis control, the dry run function is:
0: Disabled.
1: Enabled.

 # 5 IFV When bit 2 (OVE) of parameter No. 8001 is set to 1 in PMC axis control, the feedrate override signal *EFOVx and the override cancel signal OVC are:
0: Used on a path-by-path basis. (The start groups (1st group, 5th group, ... 33rd group, 37th group) of each path are used.)
1: Used on a group-by-group basis.

	#7	#6	#5	#4	#3	#2	#1	#0
8006		EZR		EFD			MLS	

[Input type] Parameter input
[Data type] Bit path

 # 1 MLS When bit 0 of parameter No. 8001 is set to 1 (to disable the all axis machine lock signal) in PMC axis control, axis-by-axis machine lock is:
0: Disabled.
1: Enabled.

 # 4 EFD When cutting feed (feed per minute) is used in PMC axis control, the specification unit of feedrate data is:
0: Unchanged (1 times).
1: 100 times greater.

NOTE
When this parameter is set to 1, bit 3 of parameter No. 8002 is invalid.

 # 6 EZR In PMC axis control, bit 0 (ZRNx) of parameter No. 1005 is:
0: Invalid.
With a PMC controlled axis, the alarm (PS0224) is not issued.
1: Valid.
A reference position return state check is made on a PMC controlled axis as with an NC axis according to the setting of bit 0 (ZRNx) of parameter No. 1005.

	#7	#6	#5	#4	#3	#2	#1	#0

8008								EMRx

[Input type] Parameter input
[Data type] Bit axis

 # 0 EMRx When a PMC axis control command is issued in mirror image state, the mirror image is:
0: Not considered.
1: Considered.
This parameter is valid in the mirror image mode set with the mirror image signals MI1 to MI8 (G106#0 to 7) set to 1 or bit 0 (MIRx) of parameter No. 12 set to 1.
If a movement is made along the same axis by doubly specifying a command with the CNC and PMC axis control when this parameter is set to 0, and the mirror image mode is set, a coordinate shift can occur afterwards. So, do not attempt to make such a movement.

8010	Selection of the DI/DO group for each axis controlled by the PMC

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 1 to 40
Specify the DI/DO group to be used to specify a command for each PMC-controlled axis.

For addresses of the fifth group and up, 1000 is added in steps of 4 groups.
For example:
The start address of the 10th group is G2154.
The start address of the 25th axis is G6142.

P8010	Description
1	DI/DO 1st group (G142 to G153) is used.
2	DI/DO 2nd group (G154 to G165) is used.
3	DI/DO 3rd group (G166 to G177) is used.
4	DI/DO 4th group (G178 to G189) is used.
5	DI/DO 5th group (G1142 to G1153) is used.
6	DI/DO 6th group (G1154 to G1165) is used.
:	:
13	DI/DO 13th group (G3142 to G3153) is used.
:	:
20	DI/DO 20th group (G4178 to G4189) is used.
21	DI/DO 21st group (G5142toG5153) is used.
:	:
29	DI/DO 29th group (G7142toG7153) is used.
:	:
35	DI/DO 35th group (G8166toG8177) is used.
36	DI/DO 36th group (G8178toG8189) is used.
37	DI/DO 37th group (G9142toG9153) is used.
38	DI/DO 38th group (G9154toG9165) is used.
39	DI/DO 39th group (G9166toG9177) is used.
40	DI/DO 40th group (G9178toG9189) is used.

> **NOTE**
> When a value other than the above is set, the axis is not controlled by the PMC.

	#7	#6	#5	#4	#3	#2	#1	#0
8011								XRT

[Input type] Parameter input
[Data type] Bit axis

 # 0 XRT The axis that uses the group specified by parameter No. 8010 is:
0: Not controlled by the real time custom macro.
1: Controlled by the real time custom macro.

> **NOTE**
> 1 This parameter is invalid for the axis for which 0 or a value outside the range is set by parameter No. 8010
> 2 When multiple axes are assigned to the same group by parameter No. 8010, these axes cannot be controlled by the real time custom macro. When multiple axes are assigned to the same group, be sure to set this bit to 0.
> 3 When this parameter (No. 8011) is all 0s, the axis is used for PMC axis control.

8020	FL feedrate for reference position return along each axis in PMC axis control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

For each axis, this parameter sets a feedrate (FL feedrate) after deceleration for reference position return in PMC axis control.

NOTE
If 0 is specified, the value of parameter No. 1425 is used.

8022	Upper limit rate of feed per revolution during PMC axis control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets the upper limit rate of feed per revolution during PMC axis control.

8028	Time for acceleration/deceleration calculation when a feedrate is specified under PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 0 to 32767

When a feedrate is specified under PMC axis control, acceleration/deceleration can be set for parameter No. 8032 or this parameter. When 0 is set in parameter No. 8032, the specification of 1000 min^{-1} is assumed. When 0 is set in this parameter, the acceleration/deceleration function for feedrate specification is disabled.

8030	Time constant for exponential acceleration/deceleration in cutting feed or continuous feed under PMC axis control

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] msec
[Valid data range] 0 to 4000

For each axis, this parameter sets a time constant for exponential acceleration/deceleration in cutting feed or continuous feed under PMC axis control.

> **NOTE**
> When 0 is set in this parameter, the value set in parameter No. 1622 is used.
> The value set in parameter No. 1622 is used also for linear acceleration/deceleration after cutting interpolation.

8031	FL feedrate for exponential acceleration/deceleration in cutting feed or continuous feed under PMC axis control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

For each axis, this parameters sets a lower feedrate limit (FL feedrate) for exponential acceleration/deceleration in cutting feed or continuous feed under PMC axis control.

> **NOTE**
> When 0 is set in this parameter, the value set in parameter No. 1623 is used.
> However, be sure to set 0 in this parameter and parameter No. 1623 for all axes at all times except for special purposes. If a value other than 0 is specified, correct linear or circular figures cannot be obtained.

8032	Feedrate for acceleration/deceleration calculation when a feedrate is specified under PMC axis control

[Input type] Parameter input
[Data type] Word axis
[Unit of data] min^{-1}
[Valid data range] 0 to 32767

When a feedrate is specified under PMC axis control, acceleration/deceleration can be set for this parameter or parameter No. 8028. When 0 is set in this parameter, the specification of 1000 min^{-1} is assumed. When 0 is set in parameter No. 8028, the acceleration/deceleration function for feedrate specification is disabled.

4.50 PARAMETERS OF MULTI-PATH CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
8100	NWP	DSB					IAL	RST

[Input type] Parameter input
[Data type] Bit machine group

 # 0 RST The pressing of the reset key on the MDI panel is:
0: Valid for all paths within the same machine group.
1: Valid only for the path selected by the path selection signal.

 # 1 IAL Choice of an option concerning operation continuation when an alarm is issued, and choice of an option concerning the start of automatic operation in alarm state:
0: - When an alarm is issued, the operation is stopped with the other path(s) in same group placed in hold state.
- When the other path or paths in same group are placed in alarm state, automatic operation cannot be started.
1: - Even when an alarm is issued, the operation is continued without stopping the other path(s).
- Even when the other path or paths in same group are placed in alarm state, automatic operation can be started.

 # 6 DSB The inter-path single block check function is:
0: Disabled.
When a single block stop occurs with a path, no single block stop occurs with the other path(s).
1: Enabled.
When a single block stop occurs with a path, a feed hold stop occurs with all paths in the same machine group.

 # 7 NWP Servo activation is turned on:
0: Together with other machine groups. (Servo activation is not turned on until other machine groups are ready to turn on servo activation.)
1: Independently of other machine groups. (Each machine group turns on servo activation even if other machine groups are not ready to turn on servo activation.)

	#7	#6	#5	#4	#3	#2	#1	#0
8103							MWP	MWT

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 MWT As the signal interface for the waiting M code:
0: The signal interface for three paths is used.
1: The conventional signal interface for two paths is used.
This parameter can be selected only when 2-path control is used.

 # 1 MWP To specify a P command for the waiting M code/balance cut:
0: A binary value is used as conventionally done.
1: A path number combination is used.

	#7	#6	#5	#4	#3	#2	#1	#0
8104								LSL

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 LSL A loader path screen is selected by:
0: Path selection signal (G063#0, G062#0, G408#1, or G408#2). (A type)
1: SHIFT+HELP or signal G251.1. (B type) (FS16 compatible specifications)

> **NOTE**
> When there are multiple loader paths, set this parameter to 0.

8110	Waiting M code range (minimum value)
8111	Waiting M code range (maximum value)

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 ,100to99999999

A range of M code values can be set by specifying a minimum waiting M coder value (parameter No. 8110) and a maximum waiting M code value (parameter No. 8111).

(parameter No. 8110) ≤ (waiting M code) ≤ (parameter No. 8111)

Set 0 in these parameters when the waiting M code is not used.

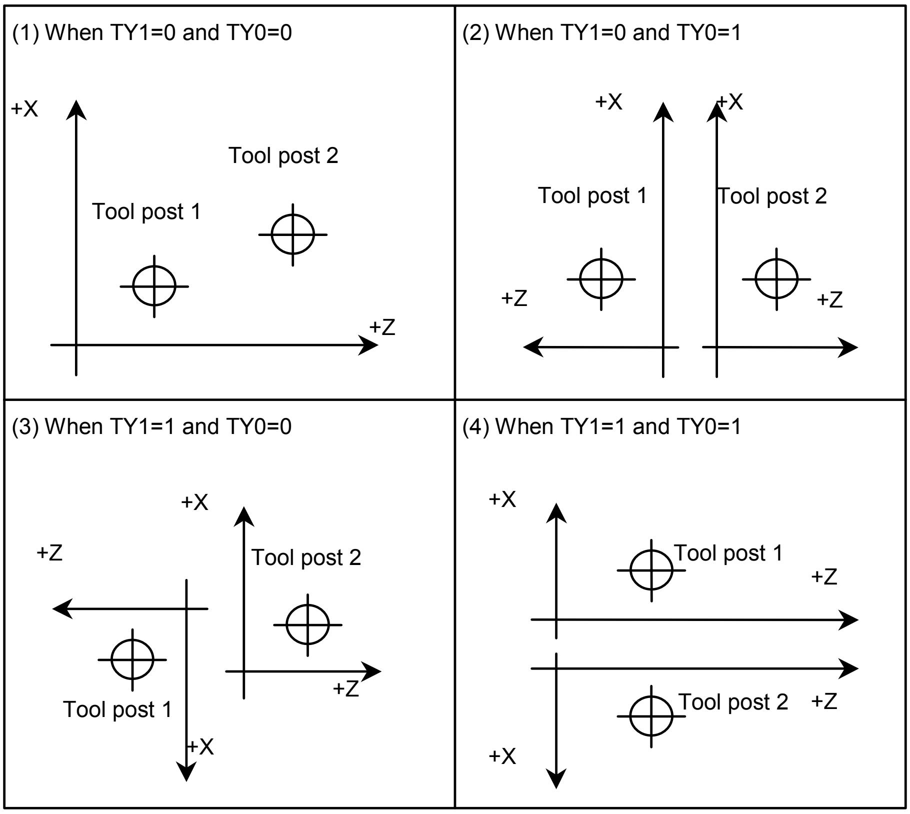
4.51 PARAMETERS OF INTERFERENCE CHECK BETWEEN PATHS

	#7	#6	#5	#4	#3	#2	#1	#0
8140	IPF		ZCL	IFE	IFM	IT0	TY1	TYO

[Input type] Parameter input
[Data type] Bit

 # 0 TY0 This parameter sets the coordinate system relationship between two tool posts based on the tool post of path 1.

 # 1 TY1 This parameter is used for checking the interference between two paths when bit 7 (IPF) of parameter No. 8140 is set to 0.



 # 2 IT0 When offset number 0 is specified by the T code,

0: Checking interference between paths is stopped until an offset number other than 0 is specified by the next T code.
1: Checking interference between paths is continued according to the previously specified offset number.

 # 3 IFM In manual mode, a interference check between paths is:

0: Not performed.
1: Performed.

# 4	**IFE**	Interference check between paths is: 0: Performed. 1: Not performed.
# 5	**ZCL**	Specifies whether interference along the Z axis is checked while checking interference between paths. 0: Checked. 1: Not checked (Only interference along the X axis is checked.)
# 7	**IPF**	In inter-path interference checking: 0: The interference between two paths is checked. 1: The interference among multiple paths is checked. Even in two-path control, the specification of a multi-path interference check can be applied. If this parameter is set to 0 when three or more paths are controlled, a two-path interference check is made only with path 1 and path 2.

8141	Distance along the X axis between the reference positions of tool post 1 and tool post n in the same machine group

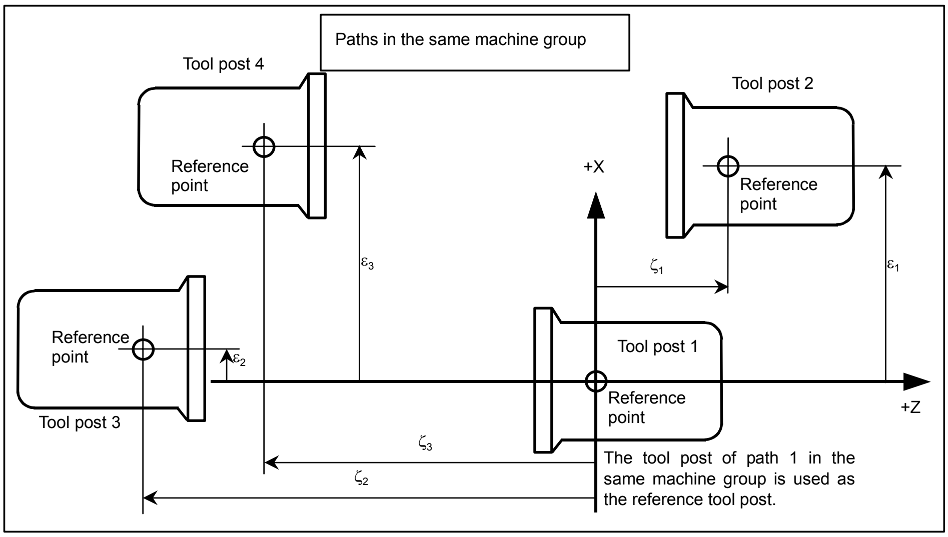
8143	Distance along the Z axis between the reference positions of tool post 1 and tool post n in the same machine group

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm, inch (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A)) (When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the distance between the reference positions of the tool post of path 1 and tool post of each path in the same machine group.

Set 0 in parameter No. 8141 and No.8143 for tool post 1 of each machine group.

For the lathe system, only a Z-X coordinate system based on parameter No. 8141 and No. 8143 is used for setting.



In the example above, the same machine group contains tool posts for four paths. In the ZX plane coordinate system with its origin placed at the reference position of tool post 1 of path 1 in the same machine group, the position of the reference position of tool post 2 of path 2 is specified by setting the value ε_1 of the X component in parameter No. 8141 for path 2 and by setting the value ξ_1 of the Z component in parameter No. 8143 for path 2.
Similarly, In the ZX plane coordinate system with its origin placed at the reference position of tool post 1, the position of the reference position of tool post 3 of path 3 is specified by setting the value ε_2 of the X component in parameter No. 8141 for path 3 and by setting the value ξ_2 of the Z component in parameter No. 8143 for path 3. In the ZX plane coordinate system with its origin placed at the reference position of tool post 1, the position of the reference position of tool post 4 of path 4 is specified by setting the value ε_3 of the X component in parameter No. 8141 for path 4 and by setting the value ξ_3 of the Z component in parameter No. 8143 for path 4.
The unit of setting is the least input increment. For an axis based on diameter specification, make a setting using a diameter value.

⚠ WARNING

Measure (ε_1, ξ_1), (ε_2, ξ_2), and (ε_3, ξ_3) in the state where reference position return operation is completed for all axes (the tool is at the reference position.)
After modifying parameter No. 8141 and No. 8143 for each path, be sure to perform a reference position return operation along all axes in all paths. Otherwise, the internally stored positional relationships of the tool posts are not updated to the newly set parameter values.

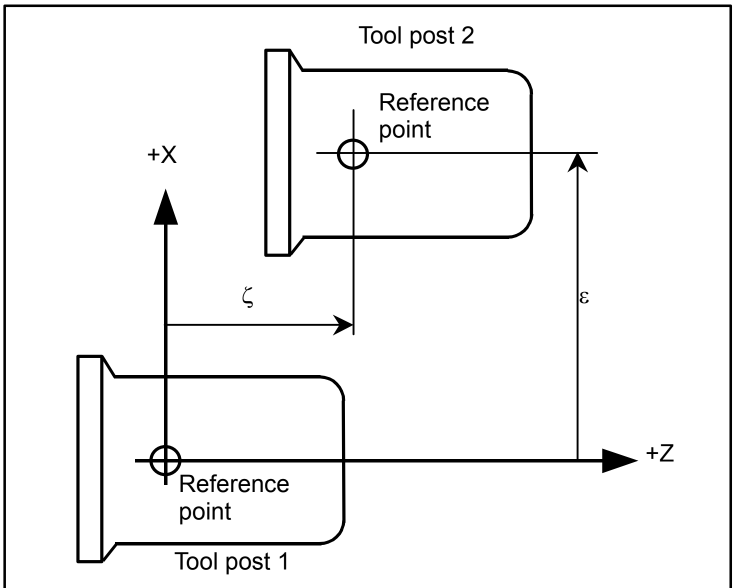
8151	**Distance along the X axis between the reference positions of tool posts 1 and 2**

8152	Distance along the Z axis between the reference positions of tool posts 1 and 2

[Input type] Parameter input
[Data type] Real
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters are used for checking the interference between two paths when bit 7 (IPF) of parameter No. 8140 is set to 0.

Each of these parameters sets the distance between the tool posts of two paths.



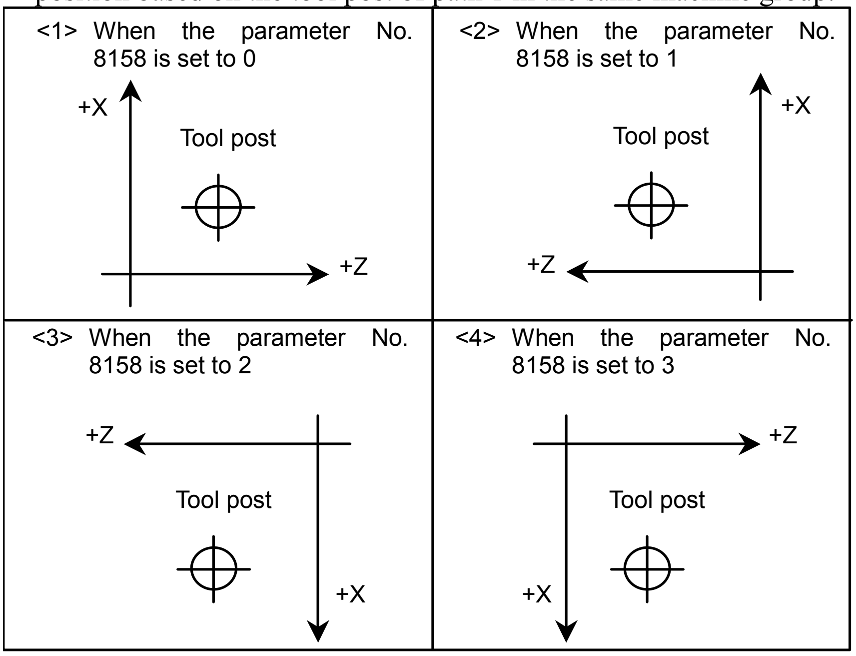
In the Z-X plane coordinate system with its origin at the represent position of tool post 1, set the X component value ε of the reference position of tool post 2 in parameter No. 8151 and set the Z component value ξ in parameter No. 8152.

> ⚠ **WARNING**
> After modifying the parameter values, perform a manual reference position return operation for both tool posts. Otherwise, the internally stored positional relationships of the two tool posts are not updated to the newly set parameter values.

8158	**Coordinate system pattern with the reference position based on the tool post of path 1 in the same machine group**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 3

This parameter is used for checking the interference among multiple paths when bit 7 (IPF) of parameter No. 8140 is set to 1.
This parameter sets a coordinate system pattern with the reference position based on the tool post of path 1 in the same machine group.



4.52 PARAMETERS OF AXIS RECOMPOSITION AND SUPERIMPOSED CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
8160	NRS	SPE	NCS	AXS				

[Input type] Parameter input
[Data type] Bit path

 # 4 AXS When the axis movement in-progress signal (Fn102) or the axis movement direction signal (Fn106) of the slave axis in superimposed control is output:
0: State output is performed according to the result of adding superimposed move pulses.
1: State output is performed according to the result of movement along each axis instead of superimposed move pulses.

 # 5 NCS If an overtravel alarm is issued for an axis under synchronous, composite, or superimposed control, synchronous, composite, or superimposed control is:
0: Released.
1: Not released.

> **NOTE**
> After updating the value of this parameter, perform a manual reference position return operation for both tool posts. Otherwise, the internally stored positional relationships of the two tool posts are not updated to the newly set parameter value.

 # 6 SPE The synchronization deviation is:
0: The difference between the positioning deviation of the master axis and that of the slave axis.
1: The difference between the positioning deviation of the master axis and that of the slave axis plus the acceleration/deceleration delay.

> **NOTE**
> 1 When the master and slave axes have different acceleration/deceleration time constants, set 1.
> 2 SPE is valid when bit 1 (SERx) of parameter No. 8162 is set to 1. SPE is used to find a synchronization deviation for comparison with parameter No. 8181.

 # 7 NRS When the system is reset, synchronous, composite, or superimposed control is:
0: Released.
1: Not released.

	#7	#6	#5	#4	#3	#2	#1	#0

8161	NSR		CRZ					NMR

[Input type] Parameter input
[Data type] Bit

 # 0 NMR When an axis subject to composite control is placed in servo-off state:
0: Composite control is stopped
1: Composite control is not stopped, provided bit 0 (FUP) of parameter No.1819 is set to 1 to disable follow-up for the axis.

 # 5 CRZ If the state of the composite control signal is switched in composite control on two axes under Cs contour control, the reference position establishment state of the two axes in composite control is:
0: Maintained. (The unestablished state is not assumed.)
1: Assumed to be unestablished.

 # 7 NSR When servo-off occurs with an axis in synchronous control:
0: Synchronous control is canceled.
1: Synchronous control is not canceled if follow-up operation is disabled for the axis (with bit 0 (FUPx) of parameter No. 1819 set to 1).

	#7	#6	#5	#4	#3	#2	#1	#0
8162	MUMx	MCDx	MPSx	MPMx	OMRx	PKUx	SERx	SMRx

[Input type] Parameter input
[Data type] Bit axis

 # 0 SMRx Synchronous mirror-image control is:
0: Not applied. (The master and slave axes move in the same direction.)
1: Applied. (The master and slave axes move in opposite directions.)

 # 1 SERx The synchronization deviation is:
0: Not detected.
1: Detected.

NOTE
When both master and slave axes move in synchronization, the positioning deviations of the corresponding axes are compared with each other. If the difference is greater than or equal to the value specified in parameter No.8181, an alarm occurs. When either axis is in the parking or machine-locked state, however, the synchronization deviation is not detected. If the master axis and slave axis are in the same path, synchronization deviation detection cannot be performed.

 # 2 PKUx In the parking state,
0: The absolute, relative, and machine coordinates are not updated.
1: The absolute and relative coordinates are updated. The machine coordinates are not updated.

> **NOTE**
> 1 With an axis for which polar coordinate interpolation is specified, set this parameter to 1. If this parameter is set to 0, a coordinate shift can occur when a single block stop or feed hold is performed in the polar coordinate interpolation mode.
> 2 With an axis that is set to function as a synchronous master axis and synchronous slave axis at the same time (with bit 1 (SYWx) of parameter No. 8167), set this parameter to 1.
> 3 With an axis specified in the three-dimensional coordinate conversion mode, set this parameter to 1. If this parameter is set to 0, the alarm (PS0367) is issued.

 # 3 OMRx Superimposed mirror-image control is:
0: Not applied. (The superimposed pulse is simply added.)
1: Applied. (The inverted superimposed pulse is added.)

 # 4 MPMx When composite control is started, the workpiece coordinate system is:
0: Not set automatically.
1: Set automatically.

> **NOTE**
> When the workpiece coordinate system is automatically set at the start of composite control, it is calculated from the following: Current machine coordinates and the workpiece coordinates at the reference point of each axis (parameter No.8184).

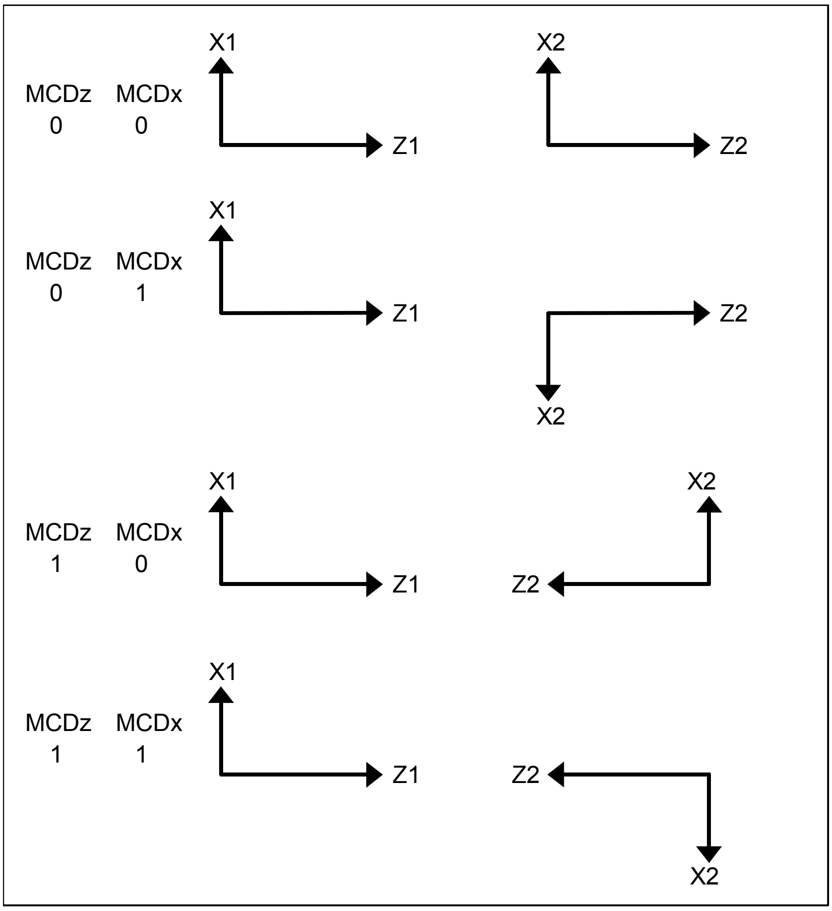
 # 5 MPSx When composite control is terminated, the workpiece coordinate system is:
0: Not set automatically.
1: Set automatically.

> **NOTE**
> When the workpiece coordinate system is automatically set at the end of composite control, it is calculated from the following: Current machine coordinates and the workpiece coordinates at the reference point of each axis under composite control (parameter No.1250)

 # 6 MCDx The axes to be replaced with each other under composite control have the coordinate systems placed:

0: In the same direction. Simple composite control is applied. (A movement is made in the same direction along the corresponding axis.)

1: In opposite directions. Mirror-image composite control is applied. (A movement is made in the reverse direction along the corresponding axis.)



 # 7 MUMx In composite control, a move command for the axis:

0: Can be specified.

1: Cannot be specified.

> **NOTE**
> Upon the execution of a move command along an axis for which MUMx is set to 1 during mixed control, alarm PS0353 is issued. For example, when axis X1 and axis X2 are placed under composite control, and a command for axis X2 (motor for axis X1) is to be disabled, set MUMx for path 2 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
8163	NUMx	MMIx	SMIx	SCDx	SCMx	SPSx	SPMx	

[Input type] Parameter input
[Data type] Bit axis

 # 1 SPMx When synchronous control is started, automatic workpiece coordinate system setting for the master axis is
0: Not Performed.
1: Performed.

> **NOTE**
> When a workpiece coordinate system is automatically set at the start of synchronous control, the workpiece coordinate system is calculated from the current machine coordinates and the workpiece coordinates of each axis at the reference position set in parameter No.8185.

 # 2 SPSx When synchronous control terminates, automatic workpiece coordinate system setting for the master axis is:
0: Not performed.
1: Performed.

> **NOTE**
> When a workpiece coordinate system is automatically set at the end of synchronous control, the workpiece coordinate system is calculated from the current machine coordinates and the workpiece coordinates for each axis at the reference position set in parameter No.1250.

 # 3 SCMx When workpiece coordinates are calculated in synchronous control:
0: The workpiece coordinates are calculated from the machine coordinates of the slave axis.
1: The workpiece coordinates are calculated from the machine coordinates of the master axis and slave axis.

 # 4 SCDx The positive (+) directions of the master axis and slave axis in the coordinate system in synchronous control are:
0: Identical.
1: Opposite.
Set the parameters SPMx, SPSx, SCMx, and SCDx for the master axis. These settings are referenced during automatic workpiece coordinate setting for the master axis at the start of synchronous control.

 # 5 SMIx In synchronous control, the manual handle interruption amount for the master axis or the mirror image mode is:
0: Reflected in the slave axis.
1: Not reflected in the slave axis.

When this bit (SMIx) is set to 0

Manual handle interruption :
To the travel distance along the slave axis, the interruption amount of the master axis is also added.
Mirror image :
When mirror image is applied to the master axis, mirror image is also applied to the slave axis.

When this bit (SMIx) is set to 1
Manual handle interruption :
To the travel distance along the slave axis, the interruption amount of the master axis is not added.
Mirror image :
Even when mirror image is applied to the master axis, mirror image is not applied to the slave axis.

 # 6 MMIx For a composite control axis, manual handle interruption under composite control is:
0: Enabled.
1: Disabled.

 # 7 NUMx When neither synchronous control nor composite control is applied, a move command for the axis is:
0: Not disabled.
1: Disabled.

NOTE
If a move command is specified for an axis with NUMx set to 1 when neither synchronous control nor composite control is applied, alarm PS0353 is issued.

	#7	#6	#5	#4	#3	#2	#1	#0
8164		SOKx	OPSx		MCEx	MCSx	MWEx	MWSx
		SOKx	OPSx		MCEx	MCSx		

[Input type] Parameter input
[Data type] Bit axis

 # 0 MWSx In automatic workpiece coordinate system setting, performed when composite control is started, a workpiece shift and position offset are:
0: Not considered.
1: Considered.

NOTE
MWSx is enabled when bit 4 (MPMx) of parameter No.8162 is set to 1.

 # 1 MWEx In automatic workpiece coordinate system setting, performed when composite control is canceled, a workpiece shift and position offset are:
0: Not considered.

1: Considered.

> **NOTE**
> MWEx is enabled when bit 5 (MPSx) of parameter No.8162 is set to 1.

 # 2 MCSx In automatic workpiece coordinate system setting, performed when composite control is started:

0: A workpiece coordinate system is automatically set in the same way as normal.

1: The coordinate system of the other path subject to axis recomposition is used.

> **NOTE**
> MCSx is enabled when bit 4 (MPMx) of parameter No.8162 is set to 1.

 # 3 MCEx In automatic workpiece coordinate system setting, performed when composite control is canceled:

0: A workpiece coordinate system is automatically set in the same way as normal.

1: The coordinate system of the other path subject to axis recomposition is used.

> **NOTE**
> MCEx is enabled when bit 5 (MPSx) of parameter No.8162 is set to 1.

 # 5 OPSx When superimposed control is canceled, control in which an amount of movement along a master axis subject to superimposed control is added to the workpiece coordinate of a slave axis is:

0: Not applied.

1: Applied.

 # 6 SOKx If a master axis subject to superimposed control is also subject to synchronous control:

0: An alarm is issued when superimposed control is started during synchronous control.

1: No alarm is issued when superimposed control is started during synchronous control.

	#7	#6	#5	#4	#3	#2	#1	#0
8166							MIX	

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 1 MIX For composite control:

0: An interface for three paths or more is used. In this case, set the composite control axis selection signal for the axis that is placed under composite control by parameter No. 8183, from 0 to 1 or from 1 to 0.

1: The conventional 2-path interface is used. (Composite control on three paths or more is disabled.) In this case, set parameter No. 8183 for path 2, and use the composite control axis selection signal of path 1.

	#7	#6	#5	#4	#3	#2	#1	#0
8167		SPVx	SWSx	SWMx	SGSx	SGMx	SYWx	
		SPVx					SYWx	

[Input type] Parameter input
[Data type] Bit axis

 # 1 SYWx The axis is:

0: Not used as a master axis and slave axis at the same time.

1: Used as a master axis and slave axis at the same time.

 # 2 SGMx In automatic workpiece coordinate system setting at the start of synchronous control, a tool offset is:

0: Considered.

1: Not considered.

NOTE
SGMx is enabled when bit 1 (SPMx) of parameter No.8163 is set to 1.

 # 3 SGSx In automatic workpiece coordinate system setting at the end of synchronous control, a tool offset is:

0: Considered.

1: Not considered.

NOTE
SGSx is enabled when bit 2 (SPSx) of parameter No.8163 or bit 6 (SPVx) of parameter No.8167 is set to 1.

 # 4 SWMx In automatic workpiece coordinate system setting at the start of synchronous control, a workpiece shift is:

0: Not considered.

1: Considered.

NOTE
SWMx is enabled when bit 1 (SPMx) of parameter No.8163 is set to 1.

 # 5 SWSx In automatic workpiece coordinate system setting at the end of synchronous control, a workpiece shift is:
0: Not considered.
1: Considered.

> **NOTE**
> SWSx is enabled when bit 2 (SPSx) of parameter No.8163 or bit 6 (SPVx) of parameter No.8167 is set to 1.

 # 6 SPVx At the end of synchronous control, automatic workpiece coordinate system setting for the slave axis is:
0: Not performed.
1: Performed.

> **NOTE**
> When a workpiece coordinate system is automatically set at the end of synchronous control, the workpiece coordinate system is calculated from the current machine coordinates and the workpiece coordinates for each axis at the reference position set in parameter No.1250.

	#7	#6	#5	#4	#3	#2	#1	#0
8168						SVF	MSO	MPA

[Input type] Parameter input
[Data type] Bit

 # 0 MPA If an alarm concerning synchronous control, composite control, or superimposed control is issued:
0: All paths of the machine group to which the alarm occurrence path belongs are placed in feed hold state.
1: Only the path including the axis placed under synchronous control, composite control, or superimposed control is placed in the feed hold state.

 # 1 MSO When one of the following events occurs in synchronous control or composite control:
- The emergency stop signal is turned off.
- The servo-off signal is turned on.
- A servo alarm is issued.

0: The synchronous or composite control mode is canceled and follow-up operation is not performed.
For the operation to be performed when the servo-off signal is turned on, however, the setting of bit 7 (NSR) of parameter No. 8161 is used in synchronous control or the setting of bit 0 (NMR) of parameter No. 8161 is used in composite control.
1: The synchronous or composite control mode is not canceled. The following operation is performed to perform follow-up

operation:
When the emergency stop signal is turned off, the relevant path is determined and operation is performed so that the emergency stop signal is virtually turned off for the determined path.
When the servo-off signal is turned on, the relevant axis is determined and operation is performed so that the servo-off signal is virtually turned on for the determined axis.
When a servo alarm is issued, the relevant axis is determined and the alarm “SV0003 CONTINUATION OF SYNCHRONOUS OR COMPOSITE CONTROL DISABLED” is issued for the determined axis to stop moving the tool along the axis. When bit 2 (SVF) of parameter No. 8168 is set to 1, this servo-off specification follows the SVF setting.

NOTE
This setting is valid also during operation. For all axes placed under synchronous or composite control, the emergency stop signal is turned off, the servo-off signal is turned on, or a servo alarm is issued.

 # 2 SVF When an axis under composite control is placed in the servo-off state:
0: Composite control is canceled.
1: Composite control is not canceled.

Follow-up specification follows the setting of bit 0 (FUPx) of parameter No. 1819.
When bit 2 (SVF) of parameter No. 8168 is set to 1, bit 0 (NMR) of parameter No. 8161 is invalid. Bit 1 (MSO) of parameter No. 8168, specification for servo-off, is also invalid.

NOTE
If a composite control axis is placed in the servo-off state when stopped, set this parameter to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
8169								MDMx

[Input type] Parameter input
[Data type] Bit axis

 # 0 MDMx As machine coordinates in composite control:
0: Coordinates for the local path are displayed.
1: Coordinates for the other path in composite control are displayed.

8180	Master axis with which an axis is synchronized under synchronous control

[Input type] Parameter input
[Data type] Word axis

[Valid data range] 101, 102, 103, . . . , (path number)*100+(intra-path relative axis number) (101, 102, 103, . . . , 201, 202, 203, . . . , 1001, 1002, 1003, . . .)

This parameter sets the path number and intra-path relative axis number of the master axis with which each axis is synchronized. When zero is specified, the axis does not become a slave axis and is not synchronized with another axis. When an identical number is specified in two or more parameters, one master axis has two or more slave axes.

8181	Synchronization error limit of each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

When the synchronization deviation detected (SERx of Bit #1 parameter No.8162 is set to 1), this parameter specifies the limit of the difference between the positioning deviation of the slave axis and that of the master axis. Set this parameter to the slave axis.

8183	Composite control axis of the other path in composite control for each axis

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 101, 102, 103, . . . , (path number)*100+(intra-path relative axis number) (101, 102, 103, . . . , 201, 202, 203, . . . , 1001, 1002, 1003, . . .)

This parameter sets with which axis each axis is to be placed under composite control. When zero is specified, control of the axis is not replaced under composite control. An identical number can be specified in two or more parameters, but composite control cannot be exercised for all of tem at a time.

NOTE
When using the two-path interface, set this parameter for path 2.

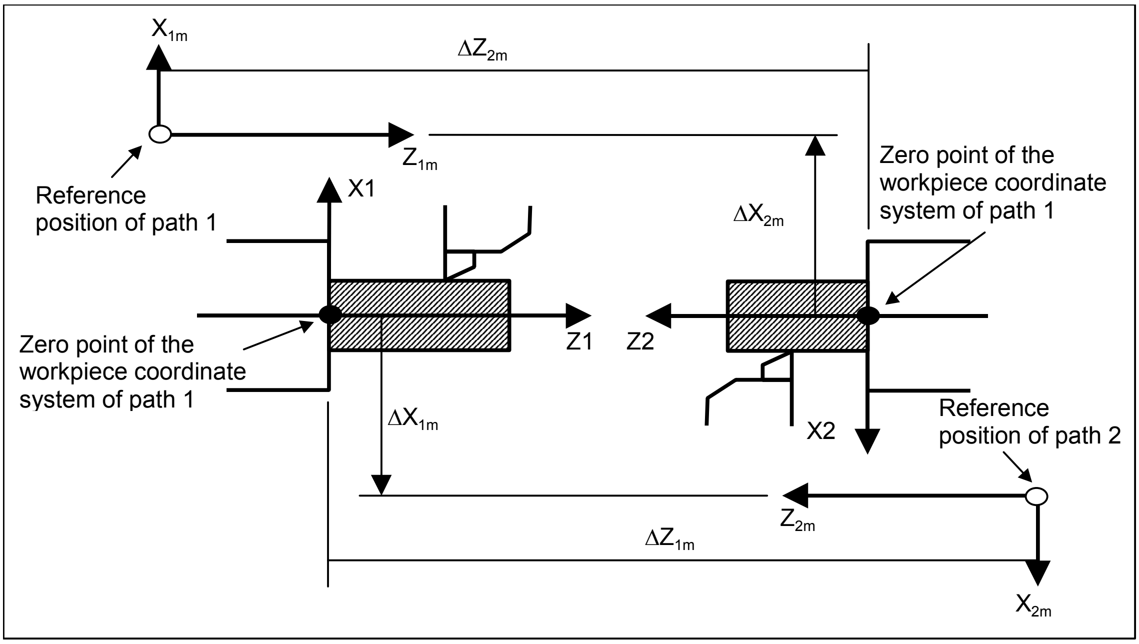
8184	Coordinates of the reference point of an axis on the coordinate system of another axis under composite control

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter specifies the coordinates of the reference point of an axis on the coordinate system of another axis under composite control.
The parameter is validated when MPMx of bit 4 parameter No.8162 is set to 1.

Example

Exercising composite control to replace the X1-axis with the X2-axis



(ΔX1m, ΔZ1m) are the coordinates of the reference point of path 2 on the workpiece coordinate system of path 1. (ΔX2m, ΔZ2m) are the coordinates of the reference point of path 1 on the workpiece coordinate system of path 2.

ΔX1m is specified for the parameter No. 8184x of path 1 and ΔX2m for the parameter No. 8184x of path 2.

If bit 4 (MPMx) of parameter No.8162 is set to 1 when composite control is started, the workpiece coordinate system satisfying the following conditions is specified:

X1 = (Value specified for the X-axis of path 1) ± (Machine coordinate of X2)

Plus when parameter MCDx (bit 6 of No.8162) of path 1 is set to 0

Minus when parameter MCDx (bit 6 of No.8162) of path 1 is set to 1

X2 = (Value specified for the X-axis of path 2) ± (Machine coordinate of X1)

Plus when parameter MCDx (bit 6 of No.8162) of path 2 is set to 0

Minus when parameter MCDx (bit 6 of No.8162) of path 2 is set to 1

If bit 5 of parameter No.8162 MPSx is set to 1 when composite control is terminated, the workpiece coordinate system satisfying the following conditions is specified:

X1 = (Parameter No.1250 of path 1) + (Machine coordinate of X1)

X2 = (Parameter No.1250 of path 2) + (Machine coordinate of X2)

8185	Workpiece coordinates on each axis at the reference position

[Input type] Parameter input

[Data type] Real axis

[Unit of data] mm, inch, degree (input unit)

[Minimum unit of data] Depend on the increment system of the applied axis

[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))

(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the workpiece coordinates on each master axis, subject to synchronous control, when the master and slave axes are at the reference position. This parameter is enabled when bit 1 (SPMx) of parameter No.8163 is set to 1. Set this parameter for the master axis.

8186	Master axis under superimposed control

[Input type] Parameter input

[Data type] Word axis

[Valid data range] 101, 102, 103, . . . , (path number)*100+(intra-path relative axis number) (101, 102, 103, . . . , 201, 202, 203, . . . , 1001, 1002, 1003, . . .)

This parameter sets the path number and intra-path relative axis number of a superimposed master axis for each axis when superimposed control is exercised. When zero is specified, the axis does not become a slave axis under superimposed control and the move pulse of another axis is not superimposed.

An identical number can be specified in two or more parameters to exercise superimposed control simultaneously. This means that superimposed control with one master axis and multiple slave axes is possible.

A slave axis may function as the master axis of another axis to allow three-generation superimposed control: parent (master axis) - child (slave axis/master axis) - grandchild (slave axis).

In this case, a movement along the child is made by its travel distance plus the travel distance of the parent, and a movement along the grandchild is made by its travel distance plus the travel distance of the child plus the travel distance of the parent.

Example of the relationship of parent (X1 of path 1) - child (X2 of path 2) - grandchild (X3 of path 3):
The travel distance of X1 is superimposed on X2, and the travel distances of X1 and X2 are further superimposed on X3.

Parameter No. 8186x of path 2 = 101
Parameter No. 8186x of path 3 = 201

4.53 PARAMETERS OF ANGULAR AXIS CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
8200						AZR		AAC

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 AAC
0: Does not perform angular axis control.
1: Performs inclined axis control.

 # 2 AZR
0: The machine tool is moved along the Cartesian axis during manual reference position return along the slanted axis under angular axis control.
1: The machine tool is not moved along the Cartesian axis during manual reference position return along the slanted axis under angular axis control.

	#7	#6	#5	#4	#3	#2	#1	#0
8201	ADG	A53				AO3	AO2	AOT

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 AOT Stored stroke limit 1 under angular axis control is handled as:
0: Value in the slanted coordinate system.
1: Value in the Cartesian coordinate system.

 # 1 AO2 Stored stroke limit 2 under angular axis control is handled as:
0: Value in the slanted coordinate system.
1: Value in the Cartesian coordinate system.

 # 2 AO3 Stored stroke limit 3 under angular axis control is handled as:
0: Value in the slanted coordinate system.
1: Value in the Cartesian coordinate system.

 # 6 A53 So far, if a slanted axis is singly specified by a machine coordinate command (G53) in angular axis control, this parameter set to 0 specifies that "compensation is applied to the Cartesian axis", and this parameter set to 1 specifies that "a movement is made along the slanted axis only". However, the specification has been changed so that "a movement is made along the slanted axis only", regardless of whether this parameter is set to 0 or 1.

 # 7 ADG The contents of diagnostic data Nos. 306 and 307 are:
0: Not swapped. The slanted axis and Cartesian axis are displayed in this order.
1: Swapped. The Cartesian axis and slanted axis are displayed in this order.

8210	Slant angle of a slanted axis in angular axis control

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] -180.000 to 180.000. However, angular axis control is disabled in the ranges -95.000 to -85.000 and 85.000 to 95.000 (in the case of IS-B).

8211	Axis number of a slanted axis subject to angular axis control

8212	Axis number of a Cartesian axis subject to slanted axis control

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to number of controlled axes
When angular axis control is to be applied to an arbitrary axis, these parameters set the axis numbers of a slanted axis and Cartesian axis. If 0 is set in either of the two parameters, the same number is set in the two parameters, or a number other than the controlled axis numbers is set in either of the two parameters, a slanted axis and Cartesian axis are selected as indicated in the following table:

	Slanted axis	Cartesian axis
M series	Y-axis (axis with 2 set in parameter No. 1022) of the basic three axes	Z-axis (axis with 3 set in parameter No. 1022) of the basic three axes
T series	X-axis (axis with 1 set in parameter No. 1022) of the basic three axes	Z-axis (axis with 3 set in parameter No. 1022) of the basic three axes

4.54 PARAMETERS OF FEED AXIS SYNCHRONOUS CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
8301				SYA				

[Input type] Parameter input
[Data type] Bit path

 # 4 SYA In the servo-off state in feed axis synchronous control, the limit of the difference between the positioning deviation of the master axis and that of the slave axis is:
0: Not checked.
1: Checked.

	#7	#6	#5	#4	#3	#2	#1	#0
8302	SMA							

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 7 SMA When an absolute position detector is attached, and bit 4 (APZ) of parameter No. 1815 for an axis in synchronous operation is set to OFF, APZ of the pairing axis in synchronous operation is:
0: Not set to OFF.
1: Set to OFF.

	#7	#6	#5	#4	#3	#2	#1	#0
8303	SOF					SAF	ATS	ATE

[Input type] Parameter input
[Data type] Bit axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 ATE In feed axis synchronous control, automatic setting for grid positioning is:
0: Disabled
1: Enabled
Set this parameter with a slave axis.

 # 1 ATS In feed axis synchronous control, automatic setting for grid positioning is:
0: Not started
1: Started
Set this parameter with a slave axis.

> **NOTE**
> When starting automatic setting for grid positioning, set ATS to 1. Upon the completion of setting, ATS is automatically set to 0.

 # 2 SAF In feed axis synchronous control, a movement along a slave axis is:
0: Not added to actual feedrate display.
1: Added to actual feedrate display.
Set this parameter with a slave axis.

 # 7 SOF In feed axis synchronous control, the synchronization establishment function based on machine coordinates is:
0: Disabled.
1: Enabled.
Set this parameter with a slave axis.
When using synchronization error compensation, set this parameter to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
8304	SYE	SMS	SCA	MVB	CLP	ADJ		SSA

[Input type] Parameter input
[Data type] Bit axis

 # 0 SSA When the one-direction synchronization establishment function under feed axis synchronous control is used:
0: The axis with a larger machine coordinate is used as the reference.
1: The axis with a smaller machine coordinate is used as the reference.

> **NOTE**
> 1 When this parameter is set, the power must be turned off before operation is continued.
> 2 Set this parameter (SSA) to the same value for both the master and slave axes.

 # 2 ADJ In feed axis synchronous control, this parameter specifies an axis along which a movement is made in the modification mode.
0: A movement is not made in the modification mode along the axis.
1: A movement is made in the modification mode along the axis.
When this parameter is set to 1, the modification mode is set.
Along an axis with this parameter set to 1, a movement is made by a move command for the master axis.

Set this parameter for one of the master and slave axes.
When there are multiple slave axes for one master axis, set this parameter to 1 for an axis with which a synchronization error excessive alarm is issued for recovery. If an alarm is issued with multiple axes, modify this parameter after recovery of one axis to recover another axis.

 # 3 CLP In axis feed synchronous control, synchronization error compensation is:
0: Disabled.
1: Enabled.
Set this parameter with a slave axis.

 # 4 MVB In the modification mode, a move command in a direction that increases a synchronization error is:
0: Ignored.
1: Valid.
When there are multiple slave axes for one master axis, an attempt to reduce the synchronous error of a slave axis by a movement along the master axis can increase the synchronization error of another slave axis. If this parameter is set to 0 in such a case, a movement can be made in neither direction along the master axis. In this case, set bit 2 (ADJ) of parameter No. 8304 to make a movement along a slave axis to perform a corrective operation.

 # 5 SCA In feed axis synchronous control:
0: Synchronous operation is performed when the feed axis synchronous control manual feed selection signal SYNCJ or the feed axis synchronous control selection signal SYNC for slave axes is set to 1.
1: Synchronous operation is performed at all times.
Set this parameter with a slave axis.

 # 6 SMS The synchronization error smooth suppress function is:
0: Disabled.
1: Enabled.
Set this parameter with a slave axis.

 # 7 SYE When external machine coordinate system shift is specified by external data input/output for the master axis in synchronous control, the slave axis is:
0: Not shifted.
1: Shifted by the same amount as specified for the master axis.
Set this parameter for the slave axis.
This function is disabled during normal operation.

	#7	#6	#5	#4	#3	#2	#1	#0
8305						SRF	SSE	SSO

[Input type] Parameter input
[Data type] Bit path

 # 0 SSO The uni-directional synchronization function in feed axis synchronous control is:
0: Disabled.
1: Enabled.

 # 1 SSE After emergency stop, the uni-directional synchronization function in feed axis synchronous control is:
0: Disabled.
1: Enabled.

 # 2 SRF In feed axis synchronous control, G28, G30, and G53:
0: Make the same movement along the slave axis as a movement along the master axis.
1: Make movements along the slave axis and master axis independently to specified positions.

8311	Axis number of master axis in feed axis synchronous control

NOTE
Set this parameter to the same value for both the master and slave axes.

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to Number of controlled axes

Select a master axis in feed axis synchronous control. In the parameter for the slave axis, set the axis number of the master axis.

Example 1)
When one set of feed axis synchronous control is used:
When the master axis is the first axis (X-axis), and the slave axis is the third axis (Z-axis), set parameter No. 8311 as follows:
Parameter No.8311 X (first axis) = 0
Parameter No.8311 Y (second axis) = 0
Parameter No.8311 Z (third axis) = 1
Parameter No.8311 A (fourth axis) = 0

Example 2)
When three sets of feed axis synchronous control is used:
When the master axes are the first axis, second axis, and third axis, and the slave axes are the sixth axis, fifth axis, and fourth axis, set parameter No. 8311 as follows:
Parameter No.8311 X (first axis) = 0
Parameter No.8311 Y (second axis) = 0
Parameter No.8311 Z (third axis) = 0
Parameter No.8311 A (fourth axis) = 3
Parameter No.8311 B (fifth axis) = 2

Parameter No.8311 C (sixth axis) = 1

8312	Enabling/disabling mirror image in feed axis synchronous control

[Input type] Parameter input
[Data type] Word axis
[Valid data range] -127 to 128

This parameter sets mirror image for the slave axis. When 100 or a more value is set with this parameter, the mirror image function is applied to synchronous control. Set this parameter to the slave axis.

Example)

For reverse synchronization with the master axis being the third axis and the slave axis being the fourth axis, set parameter No. 8312 as follows:

Parameter No.8312 X (first axis) = 0
Parameter No.8312 Y (second axis) = 0
Parameter No.8312 Z (third axis) = 0
Parameter No.8312 A (fourth axis) = 100

NOTE

In synchronous operation with mirror image applied, synchronization error compensation, synchronization establishment, synchronization error checking, and modification mode cannot be used.

8314	Maximum allowable error in synchronization error check based on machine coordinates

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets a maximum allowable error in a synchronization error check based on machine coordinates. When the error between the master and slave axes in machine coordinates exceeds the value set in this parameter, the machine stops with the servo alarm (SV0005).
Set this parameter with a slave axis.

NOTE

Set 0 in this parameter when a synchronization error check is not made.

8323	Limit in positional deviation check in feed axis synchronous control

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

This parameter sets the maximum allowable difference between the master axis and slave axis position deviations. When the absolute value of a positional deviation difference exceeds the value set in this parameter in feed axis synchronous control, the alarm (DS0001) is issued.
Set this parameter with a slave axis. If 0 is specified in this parameter, no position deviation difference check is made.

8325	Maximum compensation value in synchronization establishment based on machine coordinates

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B))
(When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the maximum compensation value for synchronization. When a compensation value exceeding the value set in this parameter is detected, the servo alarm (SV0001) is issued, and the synchronization establishment is not performed.
Specify a slave axis for this parameter. To enable this parameter, set the parameter SOF (bit 7 of parameter No.8303) to 1. When 0 is set in this parameter, synchronization establishment is not performed.

8326	Difference between master axis and slave axis reference counters

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 999999999

The difference between the master axis reference counter and slave axis reference counter (master axis and slave axis grid shift) is automatically set when automatic setting for grid positioning is performed. Then, the difference is transferred together with an ordinary grid shift value to the servo system when the power is turned on. This parameter is set with a slave axis.

8327	Torque difference alarm detection timer

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] msec
[Valid data range] 0 to 4000

This parameter sets a time from the servo preparation completion signal, SA (F000#6), being set to 1 until torque difference alarm detection is started in feed axis synchronous control.
When 0 is set in this parameter, the specification of 512 msec is assumed.
Set this parameter with a slave axis.

8330	Multiplier for a maximum allowable synchronization error immediately after power-up

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 1 to 100

Until synchronization establishment is completed immediately after power-up, synchronization error excessive alarm 2 is checked using the maximum allowable error (parameter No. 8332) multiplied by the value set in this parameter.
If the result produced by multiplying the value of parameter No. 8332 by the value of this parameter exceeds 32767, the value is clamped to 32767.

8331	Maximum allowable synchronization error for synchronization error excessive alarm 1

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 1 to 32767

This parameter sets a maximum allowable synchronization error for synchronization error excessive alarm 1.
Set this parameter with a slave axis.

8332	Maximum allowable synchronization error for synchronization error excessive alarm 2

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 1 to 32767

This parameter sets a maximum allowable synchronization error for synchronization error excessive alarm 2.
Set this parameter with a slave axis.

8333	Synchronization error zero width for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 1 to 32767

When a synchronization error below the value set in this parameter is detected, synchronization error compensation is not performed.
Set this parameter with a slave axis.

8334	Synchronization error compensation gain for each axis

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 1 to 1024

This parameter sets a synchronization error compensation gain.
Compensation pulses found by the following expression are output for the slave axis:

Compensation pulses = Synchronization error × (Ci/1024)
Ci: Compensation gain

Set this parameter with a slave axis.

8335	Synchronization error zero width 2 for each axis

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 32767

This parameter sets synchronization error zero width 2 for synchronization error smooth suppression.
Set this parameter with a slave axis.

NOTE
Set a value less than the value set in parameter No. 8333.

8336	Synchronization error compensation gain 2 for each axis

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1024

This parameter sets synchronization error compensation gain 2 for synchronization error smooth suppression.
Set this parameter with a slave axis.

> **NOTE**
> Set a value less than the value set in parameter No. 8334.

8337	M code for turning off synchronization in feed axis synchronous control

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 999999999

This parameter specifies an M code for switching from synchronous operation to normal operation.
The M code set in this parameter is not buffered.

8338	M code for turning on synchronization in feed axis synchronous control

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 999999999

This parameter specifies an M code for switching from normal operation to synchronous operation.
The M code set in this parameter is not buffered.

4.55 PARAMETERS OF SEQUENCE NUMBER COMPARISON AND STOP

8341	Program number subject to comparison and stop

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 1 to 99999999

This parameter sets the program number, including a sequence number, subject to sequence number comparison and stop. Parameter No.8342 is used to set a sequence number subject to check termination.

8342	Sequence number subject to comparison and stop

[Input type] Setting input
[Data type] 2-word path
[Valid data range] 0 to 99999999

This parameter sets the sequence number subject to sequence number comparison and stop.
If the block containing the sequence number set with this parameter is executed while the program set with parameter No.8341 is being executed, a single block stop occurs after the block is executed. At this time, the setting is automatically set to -1.

NOTE
1 When -1 is set in parameter No. 8342, comparison and stop is disabled.
2 Comparison and stop cannot be performed using a sequence number contained in a block (such as a macro statement, M98, and M99) that is processed only inside the CNC.
3 When a match is found with the sequence number of a block (such as an L specification of a canned cycle) that specifies the number of repeats, operation stops after executing as many times as the number of repeats.
4 If the sequence number set in parameter No. 8342 appears more than once in the program, operation stops at the block where the first match is found in the order of execution.

4.56 PARAMETERS OF CHOPPING

	#7	#6	#5	#4	#3	#2	#1	#0
8360	CHF					CVC		ROV

[Input type] Parameter input
[Data type] Bit path

 # 0 ROV As rapid traverse override for a section from the chopping start point to point R:
0: Chopping override is used.
1: Rapid traverse override is used.

 # 2 CVC The feedrate along the chopping axis is changed:
0: At the upper or lower dead point immediately after the feedrate change command is issued.
1: At the upper dead point immediately after the feedrate change command is issued.

 # 7 CHF On the chopping screen, the chopping feedrate:
0: Can be set.
1: Cannot be set.

8370	Chopping axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes
This parameter sets which servo axis the chopping axis corresponds to.

8371	Chopping reference point (point R)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, deg (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
The data set in this parameter is absolute coordinates.

8372	Chopping upper dead point

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm, inch, deg (input unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A)) (When the increment system is IS-B, -999999.999 to +999999.999)

The data set in this parameter is absolute coordinates.

8373	Chopping lower dead point

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm, inch, deg (input unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A)) (When the increment system is IS-B, -999999.999 to +999999.999)

The data set in this parameter is absolute coordinates.

8374	Chopping feedrate

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm/min, inch/min, deg/min (input unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets the chopping feedrate.

8375	Maximum chopping feedrate

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, deg/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

The chopping feedrate is clamped to the setting of this parameter. When this parameter is set to 0 for the chopping axis, the chopping feedrate is clamped to the rapid traverse rate (parameter No. 1420).

8376	Chopping compensation factor

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 100

The value obtained by multiply the sum of the servo delay in an chopping operation and the acceleration/deceleration delay by the rate set in this parameter is used as chopping delay compensation. When this parameter is set to 0, chopping delay compensation is not applied.

8377	Chopping compensation start tolerance

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

In a chopping operation, compensation is applied when the difference between an amount of shortage at the upper dead point and that at the lower dead point due to the servo position control delay is less than the value set in this parameter. When this parameter is set to 0, compensation is not applied.

4.57 PARAMETERS OF AI CONTOUR CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
8451	NOF			ZAG				

[Input type] Setting input
[Data type] Bit path

 # 4 ZAG The deceleration function based on cutting load in AI contour control (deceleration based on Z-axis fall angle) is:
0: Not performed.
1: Performed.
When this parameter is set to 1, be sure to set parameter Nos. 8456, 8457, and 8458.

 # 7 NOF In AI contour control, an F command is:
0: Not ignored.
1: Ignored.
When this parameter is set to 1, the specification of the maximum allowable feedrate set in parameter No. 8465 is assumed.

8456	Override for range 2 that is applied during deceleration according to the cutting load in AI contour control

8457	Override for range 3 that is applied during deceleration according to the cutting load in AI contour control

8458	Override for range 4 that is applied during deceleration according to the cutting load in AI contour control

[Input type] Setting input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 100

For the function of decelerating according to the cutting load in AI contour control, the override set in a parameter can be applied according to the angle at which the tool moves downward along the Z-axis. The feedrate obtained according to other conditions is multiplied by the override for the range containing angle θ at which the tool moves downward.
However, when bit 1 (ZG2) of parameter No. 19515 is set to 0, no parameter is available to range 1, and 100% is applied at all times. When bit 1 (ZG2) of parameter No. 19515 is set to 1, set an override value for range 1 in parameter No. 19516.

Range 1	$0° \le \theta < 30°$
Range 2	$30° \le \theta < 45°$
Range 3	$45° \le \theta < 60°$
Range 4	$60° \le \theta \le 90°$

	#7	#6	#5	#4	#3	#2	#1	#0

8459					OVRB			

[Input type] Parameter input
[Data type] Bit path

 # 3 OVRB For deceleration based on a feedrate difference or acceleration rate in AI contour control, override is:
0: Disabled.
1: Enabled.
Usually, override is enabled for a specified feedrate, and AI contour control is applied to the specified feedrate. When this parameter is set to 1, override is applied to a feedrate placed under AI contour control.

8465	Maximum allowable feedrate for AI contour control

[Input type] Setting input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)
This parameter sets the maximum allowable feedrate for contour control.
If a feedrate higher than the setting of this parameter is specified in the AI contour control mode, the feedrate is clamped to that set in this parameter.
If this parameter is set to 0, no clamping is performed.
When bit 7 (NOF) of parameter No. 8451 is set to 1, the tool moves, assuming that the feedrate set in this parameter is specified. If 0 is set in this parameter at this time, a movement is made at the specified feedrate.

8486	Maximum travel distance of a block where smooth interpolation or Nano smoothing is applied

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter specifies a block length used as a reference to decide whether to apply smooth interpolation or Nano smoothing. If the line specified in a block is longer than the value set in the parameter, smooth interpolation will not be applied to that block.

8487	Angle at which smooth interpolation or Nano smoothing is turned off

[Input type]	Setting input
[Data type]	Real path
[Unit of data]	Degree
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	0 to 90

This parameter sets the angle used to determine whether to apply smooth interpolation or Nano smoothing.

At a point having a difference in angle greater than this setting, smooth interpolation or Nano smoothing is turned off.

8490	Minimum travel distance of a block where smooth interpolation or Nano smoothing is applied

[Input type]	Setting input
[Data type]	Real path
[Unit of data]	mm, inch (input unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A))

(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a block length used to determine whether to apply smooth interpolation or Nano smoothing.

If the line specified in a block is shorter than the value set in this parameter, smooth interpolation or Nano smoothing is not applied to that block.

8491	Maximum tolerance for a block where smooth interpolation is applied

[Input type]	Setting input
[Data type]	Real path
[Unit of data]	mm, inch (input unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A))

(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a tolerance for deciding whether to perform smooth interpolation.

For a block that has a tolerance greater than the value set in this parameter, smooth interpolation is not performed. When 0 is set in this parameter, a tolerance-based decision is not made.

8492	Minimum tolerance for a block where smooth interpolation is applied

[Input type]	Setting input
[Data type]	Real path
[Unit of data]	mm, inch (input unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A)) (When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a tolerance for deciding whether to perform smooth interpolation. For a block that has a tolerance less than the value set in this parameter, smooth interpolation is not performed.

Usually, set a value of about 1/10 of the maximum tolerance value (set in parameter No. 8491). When 0.0 is set, 1/10 of the maximum tolerance (set in parameter No. 8491) is used as a minimum tolerance. When a negative value is set, a minimum tolerance of 0.0 is assumed.

4.58 PARAMETERS OF HIGH-SPEED POSITION SWITCH (1 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
8500	HPE							

[Input type] Parameter input
[Data type] Bit path

 # 7 HPE The maximum number of high-speed position switches is:
0: 6.
1: 16.

	#7	#6	#5	#4	#3	#2	#1	#0
8501						HPD	HPS	HPF

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 HPF The output signal of a high-speed position switch is output to:
0: Address Y.
1: Address F.

 # 1 HPS The current position used with the high-speed position switch:
0: Considers a servo error.
1: Does not consider a servo error.

 # 2 HPD When a high-speed position switch of direction decision type has reached (not passed) a set coordinate in a specified direction, the switch:
0: Does not operate.
1: Operates.

	#7	#6	#5	#4	#3	#2	#1	#0
8504	E08	E07	E06	E05	E04	E03	E02	E01

	#7	#6	#5	#4	#3	#2	#1	#0
8505	E16	E15	E14	E13	E12	E11	E10	E09

[Input type] Parameter input
[Data type] Bit path

E01 to E16 These parameters specify whether to enable or disable each corresponding high-speed position switch.
The following table shows the correspondence between the bits and switches.
The settings of each bit have the following meaning:
0: The switch corresponding to the bit is enabled.
1: The switch corresponding to the bit is disabled (always outputs 0).

Parameter	Switch
E01	1st high-speed position switch
E02	2nd high-speed position switch
E03	3rd high-speed position switch
:	:
E16	16th high-speed position switch

	#7	#6	#5	#4	#3	#2	#1	#0
8508	D08	D07	D06	D05	D04	D03	D02	D01

	#7	#6	#5	#4	#3	#2	#1	#0
8509	D16	D15	D14	D13	D12	D11	D10	D09

[Input type] Parameter input
[Data type] Bit path

NOTE
When this parameter is set, the power must be turned off before operation is continued.

D01 to D16 These parameters set the output type of each corresponding high-speed position switch.
The following table shows the correspondence between the bits and switches.
The settings of each bit have the following meaning:
0: The output type of the switch corresponding to the bit is normal.
1: The output type of the switch corresponding to the bit is decision by direction.

Parameter	Switch
D01	1st high-speed position switch
D02	2nd high-speed position switch
D03	3rd high-speed position switch
:	:
D16	16th high-speed position switch

	#7	#6	#5	#4	#3	#2	#1	#0
8512	A08	A07	A06	A05	A04	A03	A02	A01

	#7	#6	#5	#4	#3	#2	#1	#0
8513	A16	A15	A14	A13	A12	A11	A10	A09

[Input type] Parameter input
[Data type] Bit path

A01 to A16 These parameters set the passing direction in which each corresponding high-speed position switch is turned on.
The following table shows the correspondence between the bits and switches.
The settings of each bit have the following meaning:
0: The high-speed position switch is turned on when the tool passes through the coordinates for turning the switch on in the negative (-) direction.
1: The high-speed position switch is turned on when the tool passes through the coordinates for turning the switch on in the positive (+) direction.

Parameter	Switch
A01	1st high-speed position switch
A02	2nd high-speed position switch
A03	3rd high-speed position switch
:	:
A16	16th high-speed position switch

	#7	#6	#5	#4	#3	#2	#1	#0
8516	B08	B07	B06	B05	B04	B03	B02	B01

	#7	#6	#5	#4	#3	#2	#1	#0
8517	B16	B15	B14	B13	B12	B11	B10	B09

[Input type] Parameter input
[Data type] Bit path

B01 to B16 These parameters set the passing direction in which each corresponding high-speed position switch is turned off.
The following table shows the correspondence between the bits and switches.
The settings of each bit have the following meaning:
0: The high-speed position switch is turned off when the tool passes through the coordinates for turning the switch off in the negative (-) direction.
1: The high-speed position switch is turned off when the tool passes through the coordinates for turning the switch off in the positive (+) direction.

Parameter	Switch
B01	1st high-speed position switch
B02	2nd high-speed position switch
B03	3rd high-speed position switch

:	:
B16	16th high-speed position switch

8565	Output address of the high-speed position switch signal

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 126

This parameter sets a Y signal address to which the high-speed position switch signal is output. The Y signal addresses consisting of the value set in this parameter and the set value plus 1 are used.
If a nonexistent address is set, the high-speed position switch function is disabled. When bit 0 (HPF) of parameter No. 8501 is set to 1, however, this parameter has no effect.

8570	Controlled axis for which the first high-speed position switch function is performed

8571	Controlled axis for which the second high-speed position switch function is performed

:

8579	Controlled axis for which the tenth high-speed position switch function is performed

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

Each of these parameters sets a controlled axis number for which each of the first to tenth high-speed position switch functions is performed.
Set 0 for the number corresponding to a high-speed position switch which is not to be used.

8580	**Maximum value of the operation range of the first high-speed position switch**
8581	**Maximum value of the operation range of the second high-speed position switch**
	:
8589	**Maximum value of the operation range of the tenth high-speed position switch**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the maximum value of the operation range of each of the first to tenth high-speed position switches. If such a setting that maximum value < minimum value is made, no operation range exists, so that the high-speed position switch does not operate.

8590	**Minimum value of the operation range of the first high-speed position switch**
8591	**Minimum value of the operation range of the second high-speed position switch**
	:
8599	**Minimum value of the operation range of the tenth high-speed position switch**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the minimum value of the operation range of each of the first to tenth high-speed position switches. If such a setting that maximum value < minimum value is made, no operation range exists, so that the high-speed position switch does not operate.

4.59 OTHER PARAMETERS

	#7	#6	#5	#4	#3	#2	#1	#0
8650						EKY	CNA	RSK

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 RSK When the <RESET> key is pressed, the key code is:
0: Not passed to the application.
1: Passed to the application.

 # 1 CNA If a CNC alarm is issued when the user screen for the C language executor is displayed:
0: Whether the screen display is automatically switched to the alarm screen depends on the setting of bit 7 (NPA) of parameter No. 3111.
1: The screen display is not switched to the alarm screen, regardless of the setting of bit 7 (NPA) of parameter No. 3111.

 # 2 EKY The extended portion of the MDI keys is:
0: Not read.
1: Read.

8661	Variable area size

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] KByte
[Valid data range] 0 to 59(251)

This parameter specifies the size of the static variable area that can be shared by tasks. Specify a value in 1K-byte units. The maximum size is 59K bytes (251K bytes if an optional 256KB SRAM is added). The total of the SRAM disk size and the value of this parameter should not exceed the available SRAM size minus 1K bytes (that is, 63K or 255K bytes).
When the setting of this parameter is changed, the variable area and SRAM disk are initialized.

8662	SRAM disk size

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word path
[Unit of data] KByte
[Valid data range] 4 to 63(255)

This parameter sets the size of the SRAM disk when the C language executor is used. Specify a value greater than or equal to 4K bytes in 1K-byte units. The maximum size is 63K bytes (255K bytes if the optional 256KB SRAM is added). The total of the variable area size and the value of this parameter should not exceed the available SRAM size minus 1K bytes (that is, 63K or 255K bytes).

8663	Time zone setting

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word path
[Unit of data] sec
[Valid data range] -12x3600 to 12x3600

This parameter specifies the time-zone difference from Greenwich Mean Time in seconds. The difference for Japan is -9 hours. (The setting is -9×3600 = 32400 seconds)

8760	Program number of data input/output (Power Mate CNC manager)

[Input type]	Parameter input
[Data type]	2-word path
[Valid data range]	0 to 99999999

This parameter sets the program numbers of programs to be used for inputting and outputting slave data (parameters) when the Power Mate CNC manager function is used.

For a slave specified with I/O LINK channel m and group n, the following program number is used:

Setting + (m - 1) × 100 + n × 10

8781	DRAM size used for the C language executor

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type]	Parameter input
[Data type]	Byte path
[Unit of data]	64KByte
[Valid data range]	12 to 96

This parameter sets the size of DRAM used for the C language executor. Specify a value greater than or equal to 768K bytes in 64K-byte units. When a value not within the valid data range is set, the specification of 0 is assumed.

When 0 is set, the C language executor is not started.

NOTE
The actually usable size depends on the RAM capacity and option configuration.

4.60 PARAMETERS OF MAINTENANCE

	#7	#6	#5	#4	#3	#2	#1	#0
8900								PWE

[Input type] Setting input
[Data type] Bit

 # 0 PWE The setting, from an external device and MDI panel, of those parameters that cannot be set by setting input is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
8901	MEN							FAN

[Input type] Setting input
[Data type] Bit path

 # 0 FAN A fan motor error is:
0: Detected.
1: Not detected.

> **NOTE**
> Be sure to set this parameter to 0.

 # 7 MEN The periodic maintenance screen is:
0: Displayed.
1: Not displayed.

8911	Percentage for life warning display on the periodic maintenance screen

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 99

On the periodic maintenance screen, if the remaining time of an item falls to a value less than the percentage of the life specified in this parameter, the item name and remaining time is displayed in red as a warming.

	#7	#6	#5	#4	#3	#2	#1	#0
8950								MEM

[Input type] Parameter input
[Data type] Bit

 # 0 MEM The memory contents display screen is:
0: Not displayed.
1: Is displayed.

4.61 PARAMETERS OF THE INCORRECT OPERATION PREVENTION FUNCTION

10000	Lower limit 1 of tool offsets No.01
to	to
10019	Lower limit 1 of tool offsets No.20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, without tool geometry/wear offsets, X-axis offset
- T series, with tool geometry/wear offsets, X-axis and geometry offsets
- M series, tool offset memory A offset
- M series, tool offset memory B and geometry offsets
- M series, tool offset memory C, geometry, and length offsets

10020	Upper limit 1 of tool offsets No.01
to	to
10039	Lower limit 1 of tool offsets No.20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, without tool geometry/wear offsets, X-axis offset
- T series, with tool geometry/wear offsets, X-axis and geometry offsets
- M series, tool offset memory A offset
- M series, tool offset memory B and geometry offsets
- M series, tool offset memory C, geometry, and length offsets

10040	Lower limit 2 of tool offsets No.01
to	to
10059	Lower limit 1 of tool offsets No.20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, without tool geometry/wear offsets, Z-axis offset
- T series, with tool geometry/wear offsets, Z-axis and geometry offsets
- M series, tool offset memory C, geometry, and radius offsets

10060	Upper limit 2 of tool offsets No.01
to	to
10079	Upper limit 2 of tool offsets No.20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, without tool geometry/wear offsets, Z-axis offset
- T series, with tool geometry/wear offsets, Z-axis and geometry offsets
- M series, tool offset memory C, geometry, and radius offsets

10080	Lower limit 3 of tool offsets No.01
to	to
10099	Lower limit 3 of tool offsets No.20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, without tool geometry/wear offsets, tool nose radius offset
- T series, with tool geometry/wear offsets, tool nose radius and geometry offsets

10100	Upper limit 3 of tool offsets No.01
to	to
10119	Upper limit 3 of tool offsets No.20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, without tool geometry/wear offsets, tool nose radius offset
- T series, with tool geometry/wear offsets, tool nose radius and geometry offsets

10120	Lower limit 4 of tool offsets No.01
to	to
10139	Lower limit 4 of tool offsets No.20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, with tool geometry/wear offsets, X-axis and wear offsets
- M series, tool offset memory B and wear offsets
- M series, tool offset memory C, wear, and length offsets

10140	**Upper limit 4 of tool offsets No.01**
to	**to**
10159	**Upper limit 4 of tool offsets No.20**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, with tool geometry/wear offsets, X-axis and wear offsets
- M series, tool offset memory B and wear offsets
- M series, tool offset memory C, wear, and length offsets

10160	**Lower limit 5 of tool offsets No.01**
to	**to**
10179	**Lower limit 5 of tool offsets No.20**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, with tool geometry/wear offsets, Z-axis and wear offsets
- M series, tool offset memory C, wear, and radius offsets

10180	**Upper limit 5 of tool offsets No.01**
to	**to**
10199	**Upper limit 5 of tool offsets No.20**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, with tool geometry/wear offsets, Z-axis and wear offsets
- M series, tool offset memory C, wear, and radius offsets

10200	Lower limit 6 of tool offsets No.01
to	to
10219	Lower limit 6 of tool offsets No.20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, with tool geometry/wear offsets, tool noise radius and wear offsets

10220	Upper limit 6 of tool offsets No.01
to	to
10239	Upper limit 6 of tool offsets No.20

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, with tool geometry/wear offsets, tool noise radius and wear offsets

10240	Lower limit 1 of a tool offset number range No.01
to	to
10259	Lower limit 1 of a tool offset number range No.20

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets

Each of these parameters sets the lower limit of a tool offset number range.

These parameters correspond to the tool offset lower/upper limits set in parameter Nos. 10000 to 10239.

10260	Upper limit 1 of a tool offset number range No.01
to	to
10279	Upper limit 1 of a tool offset number range No.20

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets

Each of these parameters sets the upper limit of a tool offset number range.

These parameters correspond to the tool offset lower/upper limits set in parameter Nos. 10000 to 10239.

10280	Lower limit 7 of tool offsets No.01
to	to
10283	Lower limit 7 of tool offsets No.04

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))

(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, without tool geometry/wear offsets, Y-axis offset
- T series, with tool geometry/wear offsets, Y-axis and geometry offsets

10284	Upper limit 7 of tool offsets No.01
to	to
10287	Upper limit 7 of tool offsets No.04

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))

(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, without tool geometry/wear offsets, Y-axis offset
- T series, with tool geometry/wear offsets, Y-axis and geometry offsets

10288	Lower limit 8 of tool offsets No.01
to	to
10291	Lower limit 8 of tool offsets No.04

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the lower limits of the following offset values:

- T series, with tool geometry/wear offsets, Y-axis and wear offsets

10292	Upper limit 8 of tool offsets No.01
to	to
10295	Upper limit 8 of tool offsets No.04

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the upper limits of the following offset values:

- T series, with tool geometry/wear offsets, Y-axis and wear offsets

10296	Lower limit 2 of a tool offset number range No.01
to	to
10299	Lower limit 2 of a tool offset number range No.04

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets

Each of these parameters sets the lower limit of a tool offset number range.

These parameters correspond to the tool offset lower/upper limits set in parameter Nos. 10280 to 10295.

10300	**Upper limit 2 of a tool offset number range No.01**
to	**to**
10303	**Upper limit 2 of a tool offset number range No.04**

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets

Each of these parameters sets the upper limit of a tool offset number range.

These parameters correspond to the tool offset lower/upper limits set in parameter Nos. 10280 to 10295.

10304	**Lower limit of workpiece zero point offsets No.01**
to	**to**
10309	**Lower limit of workpiece zero point offsets No.06**

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the lower limit of workpiece zero point offset values.

10310	**Upper limit of workpiece zero point offsets No.01**
to	**to**
10315	**Upper limit of workpiece zero point offsets No.06**

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the upper limit of workpiece zero point offset values.

10316	Lower limit of a workpiece zero point offset range No.01
to	to
10321	Lower limit of a workpiece zero point offset range No.06

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets

Each of these parameters sets the lower limit of a workpiece zero point offset range. For an additional workpiece coordinate system, set a value after adding 1000.
These parameters correspond to the workpiece zero point offset lower/upper limits set in parameter Nos. 10304 to 10315.

10322	Upper limit of a workpiece zero point offset range No.01
to	to
10327	Upper limit of a workpiece zero point offset range No.06

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to maximum number of offset sets

Each of these parameters sets the upper limit of a workpiece zero point offset range. For an additional workpiece coordinate system, set a value after adding 1000.
These parameters correspond to the workpiece zero point offset lower/upper limits set in parameter Nos. 10304 to 10315.

10328	Lower limit of workpiece shifts

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a workpiece shift lower limit.

10329	Upper limit of workpiece shifts

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, degree (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a workpiece shift upper limit.

	#7	#6	#5	#4	#3	#2	#1	#0
10330		ASD	EBC	MID	HSC	ADC	PDC	IIC

[Input type] Parameter input
[Data type] Bit

 # 0 IIC At the time of incremental input, a confirmation message is:
0: Displayed.
1: Not displayed.

 # 1 PDC At the time of program deletion, a confirmation message is:
0: Displayed.
1: Not displayed.

 # 2 ADC At the time of deletion of all data, a confirmation message is:
0: Displayed.
1: Not displayed.

 # 3 HSC When a cycle start is executed halfway in the program, a confirmation message is:
0: Displayed.
1: Not displayed.

 # 4 MID Updated modal information is:
0: Highlighted.
1: Not highlighted.

 # 5 EBC Program sum checking is:
0: Disabled.
1: Enabled.

 # 6 ASD Axis state display is:
0: Enabled.
1: Disabled.

10331	Lower limit of external workpiece zero point offsets

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)
This parameter sets the lower limit of external workpiece zero point offsets.

10332	Upper limit of external workpiece zero point offsets

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the upper limit of external workpiece zero point offsets.

4.62 PARAMETERS OF SCREEN DISPLAY COLORS (2 OF 2)

10421	RGB value of color palette 1 for text for color set 2
10422	RGB value of color palette 2 for text for color set 2
	:
10435	RGB value of color palette 15 for text for color set 2

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 151515

Each of these parameters sets the RGB value of each color palette for text by specifying a 6-digit number as described below.
rrggbb: 6-digit number (rr: red data, gg: green data, bb: blue data)
The valid data range of each color is 0 to 15 (same as the tone levels on the color setting screen). When a number equal to or greater than 16 is specified, the specification of 15 is assumed.
Example)
When the tone level of a color is: red:1 green:2, blue:3, set 10203 in the parameter.

10461	RGB value of color palette 1 for text for color set 3
10462	RGB value of color palette 2 for text for color set 3
	:
10475	RGB value of color palette 15 for text for color set 3

[Input type] Parameter input
[Data type] 2-word
[Valid data range] 0 to 151515

Each of these parameters sets the RGB value of each color palette for text by specifying a 6-digit number as described below.
rrggbb: 6-digit number (rr: red data, gg: green data, bb: blue data)
The valid data range of each color is 0 to 15 (same as the tone levels on the color setting screen). When a number equal to or greater than 16 is specified, the specification of 15 is assumed.
Example)
When the tone level of a color is: red:1 green:2, blue:3, set 10203 in the parameter.

4.63 PARAMETERS OF THREE-DIMENSIONAL ERROR COMPENSATION3

10800	First compensation axis for three-dimensional error compensation
10801	Second compensation axis for three-dimensional error compensation
10802	Third compensation axis for three-dimensional error compensation

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to Number of controlled axes

These parameters set three compensation axes for applying three-dimensional error compensation.

10803	Number of compensation points for three-dimensional error compensation (first compensation axis)
10804	Number of compensation points for three-dimensional error compensation (second compensation axis)
10805	Number of compensation points for three-dimensional error compensation (third compensation axis)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 2 to 25

These parameters set the number of compensation points for each axis for three-dimensional error compensation.

10806	**Compensation point number of the reference position for three-dimensional error compensation (first compensation axis)**
10807	**Compensation point number of the reference position for three-dimensional error compensation (second compensation axis)**
10808	**Compensation point number of the reference position for three-dimensional error compensation (third compensation axis)**

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of compensation points
These parameters set the compensation point number of the reference position for each axis for three-dimensional error compensation.

10809	**Magnification for three-dimensional error compensation (first compensation axis)**
10810	**Magnification for three-dimensional error compensation (second compensation axis)**
10811	**Magnification for three-dimensional error compensation (third compensation axis)**

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 100
These parameters set the magnification for each axis for three-dimensional error compensation.

10812	**Compensation interval for three-dimensional error compensation (first compensation axis)**
10813	**Compensation interval for three-dimensional error compensation (second compensation axis)**
10814	**Compensation interval for three-dimensional error compensation (third compensation axis)**

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

These parameters set the compensation interval for each axis for three-dimensional error compensation.

4.64 PARAMETERS OF PMC

11900	PMC of execution order 1 in the multi-PMC function
11901	PMC of execution order 2 in the multi-PMC function
11902	PMC of execution order 3 in the multi-PMC function

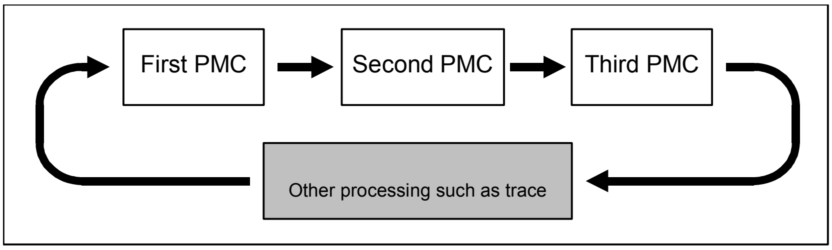
NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 3

Each of these parameters sets the execution order of each PMC when the multi-PMC function is used.

Setting value	PMC system
0	Initial setting (see below)
1	First PMC
2	Second PMC
3	Third PMC

When 0 is set in all of these parameters, the initially set execution order shown below is used.



Initial setting of multi-PMC execution order

⚠ CAUTION
If a duplicate number is set or a number is missing when a value other than 0 is set in any of these parameters, PMC alarm ERxx is issued, and none of the PMCs can be started.

11905	Execution time percentage (%) of PMC of execution order 1 in the multi-PMC function

11906	Execution time percentage (%) of PMC of execution order 2 in the multi-PMC function

11907	Execution time percentage (%) of PMC of execution order 3 in the multi-PMC function

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Unit of data] %
[Valid data range] 0 to 100

Each of these parameters sets the execution time percentage (%) of each PMC when the multi-PMC function is used.

When 0 is set in all of these parameters, the following initially set execution time percentage values are used:

Initial setting of execution time percentages in the multi-PMC function

Multi-PMC configuration	PMC of execution order 1	PMC of execution order 2	PMC of execution order 3
First PMC only	100%		
First PMC + second PMC	85%	15%	
First PMC + third PMC	85%	15%	
First PMC + second PMC + third PMC	75%	15%	10%

NOTE
1 If a too small value is specified in these parameters, the first level may not be started for each scan.
2 Even if you input the same program in both second and third PMC, the scan time of both programs may not correspond because of changing of the waiting time by execution timing.
3 If the sum of the values set in these parameters exceeds 100, PMC alarm ERxx is issued, and none of the PMCs can be started.

11910	**I/O Link channel 1 input/output addresses**
11911	**I/O Link channel 2 input/output addresses**
11912	**I/O Link channel 3 input/output addresses**
11913	**I/O Link channel 4 input/output addresses**

NOTE
When this parameter is set, the power must be turned off before operation is continued.

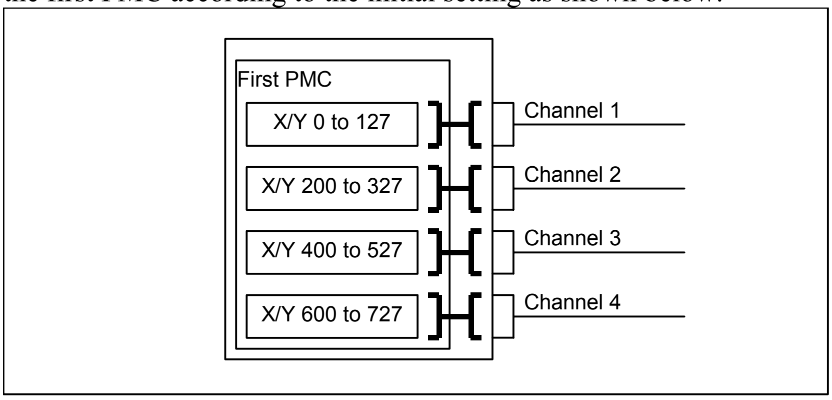
[Input type] Parameter input
[Data type] Word
[Valid data range] 0, 100 to 103, 200 to 203, 300 to 303, 900

Each of these parameters sets I/O Link input/output addresses.

Input/output addresses of I/O Link channels

Setting value	Input/output address
0	Initial setting (see below)
100	X0 to 127/Y0 to 127 of the first PMC
101	X200to327 / Y200to327 of the first PMC
102	X400to527 / Y400to527 of the first PMC
103	X600to727 / Y600to727 of the first PMC
200	X0to127 / Y0to127 of the second PMC
201	X200to327 / Y200to327 of the second PMC
202	X400to527 / Y400to527 of the second PMC
203	X600to727 / Y600to727 of the second PMC
300	X0to127 / Y0to127 of the third PMC
301	X200to327 / Y200to327 of the third PMC
302	X400to527 / Y400to527 of the third PMC
303	X600to727 / Y600to727 of the third PMC
900	X0 to 127/Y0 to 127 of the dual check safety PMC

When all of these parameters are set to 0, all channels are assigned to the first PMC according to the initial setting as shown below.



Initial input/output address setting for each I/O Link channel

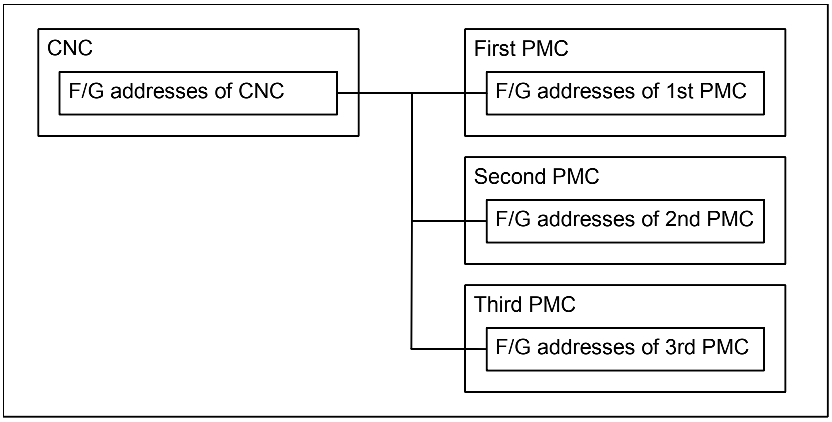
> ⚠ **CAUTION**
> 1 If a duplicate number is set when a value other than 0 is set in any of these parameters, PMC alarm "ER52 I/O LINK CHANNEL ASSIGNMENT ERROR" is issued, and none of the PMCs can be started.
> 2 If a parameter is not set, the assignment of PMC addresses to the channel is disabled.

11920	**Input/output addresses of NC-PMC interface 1**
11921	**Input/output addresses of NC-PMC interface 2**
11922	**Input/output addresses of NC-PMC interface 3**
11923	**Input/output addresses of NC-PMC interface 4**
11924	**Input/output addresses of NC-PMC interface 5**
11925	**Input/output addresses of NC-PMC interface 6**
11926	**Input/output addresses of NC-PMC interface 7**
11927	**Input/output addresses of NC-PMC interface 8**
11928	**Input/output addresses of NC-PMC interface 9**
11929	**Input/output addresses of NC-PMC interface 10**

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0, 100 to 109, 200 to 209, 300 to 309

Each of these parameters assigns PMC F/G addresses to CNC F/G addresses.



Concept of NC-PMC interface assignment

Input/output addresses of NC-PMC interfaces

Setting value	Input/output address
0	Initial setting (see below)
100	F0to767 / G0to767 of the first PMC
101	F1000to1767 / G1000to1767 of the first PMC
102	F2000to2767 / G2000to2767 of the first PMC
103	F3000to3767 / G3000to3767 of the first PMC
104	F4000to4767 / G4000to4767 of the first PMC
105	F5000to5767 / G5000to5767 of the first PMC
106	F6000to6767 / G6000to6767 of the first PMC
107	F7000to7767 / G7000to7767 of the first PMC
108	F8000to8767 / G8000to8767 of the first PMC
109	F9000to9767 / G9000to9767 of the first PMC
200	F0to767 / G0to767 of the second PMC
201	F1000to1767 / G1000to1767 of the second PMC
202	F2000to2767 / G2000to2767 of the second PMC
203	F3000to3767 / G3000to3767 of the second PMC
204	F4000to4767 / G4000to4767 of the second PMC
205	F5000to5767 / G5000to5767 of the second PMC
206	F6000to6767 / G6000to6767 of the second PMC
207	F7000to7767 / G7000to7767 of the second PMC
208	F8000to8767 / G8000to8767 of the second PMC
209	F9000to9767 / G9000to9767 of the second PMC
300	F0to767 / G0to767 of the third PMC
301	F1000to1767 / G1000to1767 of the third PMC
302	F2000to2767 / G2000to2767 of the third PMC
303	F3000to3767 / G3000to3767 of the third PMC
304	F4000to4767 / G4000to4767 of the third PMC
305	F5000to5767 / G5000to5767 of the third PMC
306	F6000to6767 / G6000to6767 of the third PMC
307	F7000to7767 / G7000to7767 of the third PMC
308	F8000to8767 / G8000to8767 of the third PMC
309	F9000to9767 / G9000to9767 of the third PMC

When 0 is set in all of these parameters, "F/G addresses of the CNC = F/G addresses of the first PMC" results according to the initial setting as shown below.

CNC	First PMC
F/G0 to 767 of CNC	F/G0 to 767 of first PMC
F/G1000 to 1767 of CNC	F/G1000 to 1767 of first PMC
F/G2000 to 2767 of CNC	F/G2000 to 2767 of first PMC
F/G3000 to 3767 of CNC	F/G3000 to 3767 of first PMC
F/G4000 to 4767 of CNC	F/G4000 to 4767 of first PMC
F/G5000 to 5767 of CNC	F/G5000 to 5767 of first PMC
F/G6000 to 6767 of CNC	F/G6000 to 6767 of first PMC
F/G7000 to 7767 of CNC	F/G7000 to 7767 of first PMC
F/G8000 to 8767 of CNC	F/G8000 to 8767 of first PMC
F/G9000to 9767 of CNC	F/G9000 to 9767 of first PMC

Initial setting of NC-PMC interfaces

⚠ CAUTION

1 If a duplicate number is set when a value other than 0 is set in any of these parameters, PMC alarm ERxx is issued, and none of the PMCs can be started.
2 If a parameter is not set, the assignment of PMC addresses to the F/G addresses of the NC is disabled.

11930	Execution interval of ladder level 1

NOTE

When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0, 4 ,8

This parameter sets the execution interval of ladder level 1.

Setting	Description
4	Executed at intervals of 4 msec.
0, 8	Executed at intervals of 8 msec.

⚠ CAUTION

If this parameter is set to a value other than 0, 4, or 8, the PMC alarm “ER55 LEVEL 1 EXECUTION INTERVAL ERROR” is issued and all PMCs are not started.

	#7	#6	#5	#4	#3	#2	#1	#0
11931								PCC

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 PCC For a multipath PMC, ladder execution and stop are:
0: Controlled individually for each PMC path.
1: Controlled simultaneously for all PMC paths.

4.65 PARAMETERS OF HIGH-SPEED POSITION SWITCH (2 OF 2)

12201	Controlled axis for which the eleventh high-speed position switch function is performed

12202	Controlled axis for which the twelfth high-speed position switch function is performed

12203	Controlled axis for which the thirteenth high-speed position switch function is performed

12204	Controlled axis for which the fourteenth high-speed position switch function is performed

12205	Controlled axis for which the fifteenth high-speed position switch function is performed

12206	Controlled axis for which the sixteenth high-speed position switch function is performed

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes

Each of these parameters sets a controlled axis number for which each of the eleventh to sixteenth high-speed position switch functions is performed.

Set 0 for the number corresponding to a high-speed position switch which is not to be used.

12221	Maximum value of the operation range of the eleventh high-speed position switch

12222	Maximum value of the operation range of the twelfth high-speed position switch

12223	Maximum value of the operation range of the thirteenth high-speed position switch

12224	Maximum value of the operation range of the fourteenth high-speed position switch

12225	Maximum value of the operation range of the fifteenth high-speed position switch

12226	Maximum value of the operation range of the sixteenth high-speed position switch

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm, inch, degree (machine unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A)) (When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the maximum value of the operation range of each of the eleventh to sixteenth high-speed position switches. If such a setting that maximum value < minimum value is made, no operation range exists, so that the high-speed position switch does not operate.

12241	**Minimum value of the operation range of the eleventh high-speed position switch**
12242	**Minimum value of the operation range of the twelfth high-speed position switch**
12243	**Minimum value of the operation range of the thirteenth high-speed position switch**
12244	**Minimum value of the operation range of the fourteenth high-speed position switch**
12245	**Minimum value of the operation range of the fifteenth high-speed position switch**
12246	**Minimum value of the operation range of the sixteenth high-speed position switch**

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm, inch, degree (machine unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A)) (When the increment system is IS-B, -999999.999 to +999999.999)

Each of these parameters sets the minimum value of the operation range of each of the eleventh to sixteenth high-speed position switches. If such a setting that maximum value < minimum value is made, no operation range exists, so that the high-speed position switch does not operate.

4.66 PARAMETERS OF MALFUNCTION PROTECTION

12255	Maximum servo motor speed

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0)

This parameter sets a maximum servo motor speed. When the value set in this parameter is exceeded, the servo motor stops with the alarm (DS0004). When 0 is set in this parameter, the specification of a maximum allowable value (999000 for IS-B) is assumed.

12256	Maximum servo motor acceleration rate

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (D) (When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)

This parameter sets a maximum servo motor acceleration rate. When the value set in this parameter is exceeded, the servo motor stops with the alarm (DS0005). When 0 is set in this parameter, alarm check is not performed.

4.67 PARAMETERS OF MANUAL HANDLE (2 OF 2)

12300	X address of the first manual handle
12301	X address of the second manual handle
12302	X address of the third manual handle

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 127

Each of these parameters sets the address (X address of the PMC) of a manual handle connected to the I/O Link.

NOTE
Set these parameters when bit 1 (HDX) of parameter No. 7105 is set to 1. When HDX = 0, these parameters are automatically set.

12310	States of the first manual handle feed axis selection signals when tool axis direction handle feed/interrupt and table-based vertical direction handle feed/interrupt are performed

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 24

This parameter sets the states of the first manual handle feed axis selection signals (HS1A to HS1E)/manual handle interrupt axis selection signals (HS1IA to HS1IE) when tool axis direction handle feed/interrupt and table-based vertical direction handle feed/interrupt are performed.

<Table of correspondence with the manual handle feed axis selection signals>

The table below indicates the correspondence between the states of the first manual handle feed axis selection signals/manual handle interrupt axis selection signals and the parameter settings in the 5-axis machining manual feed (handle feed) mode. When the first manual handle pulse generator is turned after setting the signals corresponding to the value set in the parameter, operation is performed in the specified mode.

HS1E (HS1IE)	HS1D (HS1ID)	HS1C (HS1IC)	HS1B (HS1IB)	HS1A (HS1IA)	Parameter setting
0	0	0	0	1	1
0	0	0	1	0	2
0	0	0	1	1	3
0	0	1	0	0	4
0	0	1	0	1	5
0	0	1	1	0	6
0	0	1	1	1	7
0	1	0	0	0	8
0	1	0	0	1	9
0	1	0	1	0	10
0	1	0	1	1	11
0	1	1	0	0	12
0	1	1	0	1	13
0	1	1	1	0	14
0	1	1	1	1	15
1	0	0	0	0	16
1	0	0	0	1	17
1	0	0	1	0	18
1	0	0	1	1	19
1	0	1	0	0	20
1	0	1	0	1	21
1	0	1	1	0	22
1	0	1	1	1	23
1	1	0	0	0	24

12311	States of the first manual handle feed axis selection signals when a movement is made in the first axis direction in tool axis normal direction handle feed/interrupt and table-based horizontal direction handle feed/interrupt

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 24

This parameter sets the states of the first manual handle feed axis selection signals (HS1A to HS1E)/manual handle interrupt axis selection signals (HS1IA to HS1IE) when a movement is made in the first axis direction. (For a value to be set, see "Table of correspondence with the manual handle feed axis selection signals" provided in the description of parameter No. 12310.)

The table below indicates the relationships of tool axis directions, first axis directions, and second axis directions.

Parameter No.19697	Tool axis directions	First axis directions	Second axis directions
1	X	Y	Z
2	Y	Z	X
3	Z	X	Y

Note, however, that the table above indicates the directions applicable when the angles of all rotation axes are set to 0.
In tool axis direction/tool axis normal direction feed (not table-based), the directions indicated above assume that 0 is set in parameter No. 19698 and No. 19699. When a rotation axis has made a turn or a nonzero value is set in these parameters in tool axis direction/tool axis normal direction feed, the relevant directions are inclined accordingly.

12312	States of the first manual handle feed axis selection signals when a movement is made in the second axis direction in tool axis normal direction handle feed/interrupt and table-based horizontal direction handle feed/interrupt

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 24

This parameter sets the states of the second manual handle feed axis selection signals (HS1A to HS1E)/manual handle interrupt axis selection signals (HS1IA to HS1IE) when a movement is made in the first axis direction. (For a value to be set, see "Table of correspondence with the manual handle feed axis selection signals" provided in the description of parameter No. 12310.)

12313	States of the first manual handle feed axis selection signals when the first rotation axis is turned in tool tip center rotation handle feed/interrupt

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 24

This parameter sets the states of the first manual handle feed axis selection signals (HS1A to HS1E)/manual handle interrupt axis selection signals (HS1IA to HS1IE) when the first rotation axis is turned in tool tip center rotation handle feed/interrupt. (For a value to be set, see "Table of correspondence with the manual handle feed axis selection signals" provided in the description of parameter No. 12310.)

12314	States of the first manual handle feed axis selection signals when the second rotation axis is turned in tool tip center rotation handle feed/interrupt

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 24

This parameter sets the states of the first manual handle feed axis selection signals (HS1A to HS1E)/manual handle interrupt axis selection signals (HS1IA to HS1IE) when the second rotation axis is turned in tool tip center rotation handle feed/interrupt. (For a value to be set, see "Table of correspondence with the manual handle feed axis selection signals" provided in the description of parameter No. 12310.)

12318	Tool length in 5-axis machining manual feed

[Input type] Setting input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets a tool length when tool tip center rotation feed is performed with the 5-axis machining manual feed function and when the 5-axis machining manual feed screen is displayed.

NOTE
Specify a radius value to set this parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
12320						JFR	FLL	TWD

[Input type] Parameter input
[Data type] Bit path

 # 0 TWD The directions of 5-axis machining manual feed (other than tool tip center rotation feed) when the tilted working plane command is issued are:
0: Same as those not in the tilted working plane command. That is, the directions are:
Tool axis normal direction 1 (table-based horizontal direciton 1)
Tool axis normal direction 2 (table-based horizontal direction 2)
Tool axis direction (table-based vertical direction)
1: X, Y, and Z directions in the feature coordinate system.

 # 1 FLL The directions of tool axis normal direction feed or table-based horizontal direction feed in the 5-axis machining manual feed mode are:
0: Tool axis normal direction 1 (table-based horizontal direction 1) and tool axis normal direction 2 (table-based horizontal direction 2).
1: Longitude direction and latitude direction.

Parameter FLL (No.12320#1)	Parameter TWD (No.12320#0)	Directions of 5-axis machining manual feed
0	0	Conventional directions
0	1	When the tilted working plane command is issued: X, Y, and Z directions in the feature coordinate system When the command is not issued: Conventional directions
1	0	Longitude direction and latitude direction
1	1	When the tilted working plane command is issued: X, Y, and Z directions in the feature coordinate system When the command is not issued: Longitude direction and latitude direction

 # 2 JFR As the feeedrate of 5-axis machining jog feed or incremental feed:
0: The dry run rate (parameter No. 1410) is used.
1: The jog feedrate (parameter No. 1423) is used.

12321	Normal axis direction

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 3
For longitude or latitude direction feed in the 5-axis machining manual feed mode, this parameter sets the axis parallel to the normal direction.
1 : Positive (+) X-axis direction
2 : Positive (+) Y-axis direction
3 : Positive (+) Z-axis direction
0 : Reference tool axis direction (parameter No. 19697)

12322	Angle used to determine whether to assume the tool axis direction to be parallel to the normal direction (parameter No. 12321)

[Input type] Parameter input
[Data type] Real path
[Unit of data] deg
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 0 to 90

For latitude direction feed or longitude direction feed in the 5-axis machining manual feed mode, when the angle between the tool axis direction and normal direction (parameter No. 12321) is small, the tool axis direction is assumed to be parallel to the normal direciton (parameter No. 12321). This parameter sets the maximum angle at which the tool axis direction is assumed to be parallel to the normal direction.

When this parameter is set to 0 or a value outside the valid range, it is set to 1 degree.

	#7	#6	#5	#4	#3	#2	#1	#0
12330	G17	G16	G15	G14	G13	G12	G11	G10

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 G10 When PMC group 0 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 1 G11 When PMC group 1 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 2 G12 When PMC group 2 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 3 G13 When PMC group 3 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 4 G14 When PMC group 4 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.

1: Not transferred to that group.

 # 5 **G15** When PMC group 5 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 6 **G16** When PMC group 6 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 7 **G17** When PMC group 7 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

	#7	#6	#5	#4	#3	#2	#1	#0
12331	G1F	G1E	G1D	G1C	G1B	G1A	G19	G18

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 **G18** When PMC group 8 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 1 **G19** When PMC group 9 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 2 **G1A** When PMC group 10 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 3 **G1B** When PMC group 11 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 4 **G1C** When PMC group 12 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 5 **G1D** When PMC group 13 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 6 **G1E** When PMC group 14 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 7 **G1F** When PMC group 15 (channel 1) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

	#7	#6	#5	#4	#3	#2	#1	#0
12332	G27	G26	G25	G24	G23	G22	G21	G20

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 **G20** When PMC group 0 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 1 **G21** When PMC group 1 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 2 **G22** When PMC group 2 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 3 **G23** When PMC group 3 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 4 **G24** When PMC group 4 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 5 **G25** When PMC group 5 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.

1: Not transferred to that group.

 # 6 G26 When PMC group 6 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 7 G27 When PMC group 7 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

	#7	#6	#5	#4	#3	#2	#1	#0
12333	G2F	G2E	G2D	G2C	G2B	G2A	G29	G28

[Input type] Parameter input
[Data type] Bit

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 G28 When PMC group 8 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 1 G29 When PMC group 9 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 2 G2A When PMC group 10 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 3 G2B When PMC group 11 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 4 **G2C** When PMC group 12 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 5 **G2D** When PMC group 13 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 6 **G2E** When PMC group 14 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 7 **G2F** When PMC group 15 (channel 2) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

	#7	#6	#5	#4	#3	#2	#1	#0
12334	G37	G36	G35	G34	G33	G32	G31	G30

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 **G30** When PMC group 0 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 1 **G31** When PMC group 1 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 2 **G32** When PMC group 2 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 3 **G33** When PMC group 3 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 4 **G34** When PMC group 4 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 5 **G35** When PMC group 5 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 6 **G36** When PMC group 6 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 7 **G37** When PMC group 7 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

	#7	#6	#5	#4	#3	#2	#1	#0
12335	G3F	G3E	G3D	G3C	G3B	G3A	G39	G38

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 **G38** When PMC group 8 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 1 **G39** When PMC group 9 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 2 **G3A** When PMC group 10 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 3 **G3B** When PMC group 11 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 4 **G3C** When PMC group 12 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 5 **G3D** When PMC group 13 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 6 **G3E** When PMC group 14 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 7 **G3F** When PMC group 15 (channel 3) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

	#7	#6	#5	#4	#3	#2	#1	#0
12336	G47	G46	G45	G44	G43	G42	G41	G40

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 **G40** When PMC group 0 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 1 **G41** When PMC group 1 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 2 **G42** When PMC group 2 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 3 **G43** When PMC group 3 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 4 **G44** When PMC group 4 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 5 **G45** When PMC group 5 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 6 **G46** When PMC group 6 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 7 **G47** When PMC group 7 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

	#7	#6	#5	#4	#3	#2	#1	#0
12337	G4F	G4E	G4D	G4C	G4B	G4A	G49	G48

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 **G48** When PMC group 8 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 1 **G49** When PMC group 9 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 2 **G4A** When PMC group 10 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 3 **G4B** When PMC group 11 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 4 **G4C** When PMC group 12 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 5 **G4D** When PMC group 13 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 6 **G4E** When PMC group 14 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

 # 7 **G4F** When PMC group 15 (channel 4) is a Power Mate or I/O Link β, the pulses from the manual pulse generator connected to the I/O Link are:
0: Transferred to that group.
1: Not transferred to that group.

	#7	#6	#5	#4	#3	#2	#1	#0
12750							EX5	EX4

[Input type] Parameter input
[Data type] Bit path

 # 0 **EX4** External deceleration function setting 4 is:
0: Disabled.
1: Enabled.

 # 1 **EX5** External deceleration function setting 5 is:
0: Disabled.
1: Enabled.

12751	External deceleration rate setting 4 in cutting feed

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)
Set external deceleration rate 4 for cutting feed or positioning of linear interpolation type (G00).

12752	External deceleration rate setting 4 for each axis in rapid traverse

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis

[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0) Set external deceleration rate 4 for each axis in rapid traverse.

12753	Maximum manual handle feedrate setting 4 for each axis

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0) Set a maximum manual handle feedrate 4 for each axis.

12754	External deceleration rate setting 5 in cutting feed

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0) Set external deceleration rate 5 for cutting feed or positioning of linear interpolation type (G00).

12755	External deceleration rate setting 5 for each axis in rapid traverse

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0) Set external deceleration rate 5 for each axis in rapid traverse.

12756	Maximum manual handle feedrate setting 5 for each axis

[Input type]	Parameter input
[Data type]	Real axis
[Unit of data]	mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	Refer to the standard parameter setting table (C) (When the increment system is IS-B, 0.0 to +240000.0) Set a maximum manual handle feedrate 3 for each axis.

4.68 PARAMETERS OF DISPLAY AND EDIT (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
13102	EDT							

[Input type] Parameter input
[Data type] Bit path

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 7 EDT During memory operation, program editing is:
0: Enabled.
1: Disabled.

> **NOTE**
> 1 When 0 is set, during memory operation, you can stop the program by a single block stop or feed hold, select the EDIT mode, and edit the program.
> When the main program is running:
> - The same edit functions as used for ordinary editing can be used.
>
> When a subprogram is running:
> - Only the word-unit edit function can be used.
> - Any program called from DNC or MDI operation cannot be edited.
> - Only the subprogram can be edited.
>
> 2 Before restarting memory operation, take extreme caution to return the cursor to the position before stopping the program. If you want to execute the program from other than the cursor position when stopped, be sure to reset the machine before executing the program.

	#7	#6	#5	#4	#3	#2	#1	#0
13112	NTD	NTA				SPI	SVI	IDW

[Input type] Parameter input
[Data type] Bit path

 # 0 IDW Editing on the servo or spindle information screen is:
0: Prohibited.
1: Not prohibited.

 # 1 SVI The servo information screen is:
0: Displayed.
1: Not displayed.

 # 2 SPI The spindle information screen is:
0: Displayed.
1: Not displayed.

 # 6 NTA On the 5-axis machining manual feed screen, a table-based pulse amount is:
0: Displayed.
1: Not displayed.

 # 7 NTD On the 5-axis machining manual feed screen, a tool axis based pulse amount is:
0: Displayed.
1: Not displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
13113					CFD			CLR

[Input type] Parameter input
[Data type] Bit path

 # 0 CLR Upon reset, the display of a travel distance by 5-axis machining manual feed is:
0: Not cleared.
1: Cleared.

 # 3 CFD As feedrate F, the 5-axis machining manual feed screen displays:
0: Composite feedrate at the linear axis/rotation axis control point.
1: Feedrate at the tool tip.

	#7	#6	#5	#4	#3	#2	#1	#0
13114								P15

[Input type] Parameter input
[Data type] Bit

 # 0 P15 When the screen is displayed using the CNC screen display function:
0: The 10.4” mode is used.
1: The 15” mode is used.

NOTE
This parameter is valid when the CNC screen display function is used for the stand-alone type 300*i*/310*i*/320*i*.

	#7	#6	#5	#4	#3	#2	#1	#0
13115					IAU	ITB	IAT	ICT

[Input type] Parameter input
[Data type] Bit

 # 0 ICT For MDI key input, the CTRL key is:
0: Enabled.
1: Disabled.

 # 1 IAT For MDI key input, the ALT key is:
0: Enabled.
1: Disabled.

 # 2 ITB For MDI key input, the TAB key is:
0: Enabled.
1: Disabled.

 # 3 IAU For MDI key input, the AUX key is:
0: Enabled.
1: Disabled.

13131	Group number for simultaneous display of multiple paths

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 10

This parameter sets a group for simultaneous display on one screen in a multi-path system.
The paths defined to belong to the same group are displayed on one screen.
When 0 is set in this parameter, one screen displays one path.

NOTE
When specifying groups, specify group numbers not less than 1 successively.
On 7.2-inch and 8.4-inch display units, simultaneous multi-path display cannot be specified.
In this case, set 1 in this parameter for all paths.
On 9.5-inch and 10.4-inch display units, up to three paths can be specified for simultaneous display.
On a 15-inch display unit, up to four paths can be specified for simultaneous display.

13132	Simultaneous multi-path display order number

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of paths included in a simultaneous multi-path display group

This parameter sets the display order of a path defined to belong to a simultaneous multi-path display group.
For display in an arbitrary path order, the order number is changed.

Example)
Setting of simultaneous display group numbers and simultaneous display order numbers

Number of paths of CNC	Path	Display group number	Intra-group display order number	Screen display (Numbers represent displayed path numbers.)
One path	Path 1	1	1	1
Three path	Path 1	1	1	1 2 3
	Path 2	1	2	
	Path 3	1	3	
	Path 1	1	1	1 ⇨ 2 ⇨ 3
	Path 2	2	1	
	Path 3	3	1	
	Path 1	1	2	2 1 ⇨ 3
	Path 2	1	1	
	Path 3	2	1	

NOTE
Specify successive order numbers not less than 1 for the paths defined to belong to a group.

4.69 PARAMETERS OF TOOL LIFE MANAGEMENT (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
13200	NFD	NAM	T0O	TP2	ETE	TRT	THN	TCF

[Input type] Parameter input
[Data type] Bit path

 # 0 TCF When a T code is specified with the tool management function:
0: A cartridge number and pot number found by the NC are output.
1: The specified T code is output without modification.

 # 1 THN When NX.T and HD.T are displayed with the tool management function:
0: The tool type numbers at the first spindle position and the first standby position are displayed.
1: The values specified from the PMC window are displayed.

 # 2 TRT As the remaining lifetime value for outputting the tool life arrival notice signal:
0: The remaining lifetime of the last tool is used.
1: The sum of the remaining lifetimes of the tools with the same type number is used.

> **NOTE**
> This parameter is valid when bit 3 (ETE) of parameter No. 13200 is set to 0 (arrival notice for each type number).

 # 3 ETE The tool life arrival notice signal is output:
0: For each tool type.
1: For each tool.

 # 4 TP2 The punch-out format of cartridge management data is:
0: New registration format (G10L76P1 format).
1: Modification format (G10L76P2 format).

 # 5 T0O When T0 is specified:
0: A tool search is made assuming that the tool type number is 0.
1: The cartridge number and pot number are assumed to be 0.

 # 6 NAM When a T code is specified, but a valid tool with a remaining lifetime cannot be found:
0: The alarm (PS5317) "LIVES OF ALL TOOLS EXPIRED" is issued.
1: The alarm is not issued. Instead, the tool with the maximum tool management number is selected from the tools of the specified tool type, and TMFNFD<F315#6> is set to 1.

 # 7 NFD When a T code is specified, but a valid tool with a remaining lifetime cannot be found in the cartridge:
0: The spindle position and standby position are also searched.
1: The spindle position and standby position are not searched.

	#7	#6	#5	#4	#3	#2	#1	#0
13201						TDB		TDC

[Input type] Parameter input
[Data type] Bit system common

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

 # 0 TDC The function of customizing the tool management data screen of the tool management function is:
0: Disabled.
1: Enabled.

 # 2 TDB The tool management function displays tool information in the:
0: Conventional mode.
1: 1/0 mode.

	#7	#6	#5	#4	#3	#2	#1	#0
13204								TDL

[Input type] Parameter input
[Data type] Bit system common

 # 0 TDL The protection function for tool management data using a key is:
0: Disabled.
1: Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
13202	DOM	DOT		DO2	DOB	DOY	DCR	

[Input type] Parameter input
[Data type] Bit

 # 1 DCR On the tool management function screen, tool nose radius compensation data is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or combined system.

 # 2 DOY On the tool management function screen, Y-axis offset data is:
0: Displayed.

1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or combined system.

 # 3 DOB On the tool management function screen, B-axis offset data is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or combined system.

 # 4 DO2 On the tool management function screen, the second geometry tool offset data is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or combined system.

 # 6 DOT On the tool management function screen, the tool offset data (X, Z) of the T series is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or combined system.

 # 7 DOM On the tool management function screen, the tool offset data of the M series is:
0: Displayed.
1: Not displayed.

> **NOTE**
> This parameter is valid when the machine control type is the lathe system or combined system.

	#7	#6	#5	#4	#3	#2	#1	#0
13201							TDN	

[Input type] Parameter input
[Data type] Bit

 # 1 TDN On the tool management function screen, the character string for indicating the tool life state can contain:
0: Up to 6 characters.
1: Up to 12 characters.

	#7	#6	#5	#4	#3	#2	#1	#0
13203	TCN	SWC			NM4	NM3	NM2	NM1

[Input type] Parameter input
[Data type] Bit path

 # 0 NM1 The first cartridge is:
0: Searched.
1: Not searched.

 # 1 NM2 The second cartridge is:
0: Searched.
1: Not searched.

 # 2 NM3 The third cartridge is:
0: Searched.
1: Not searched.

 # 3 NM4 The fourth cartridge is:
0: Searched.
1: Not searched.

 # 6 SWC The tools with the same tool type number are searched for:
0: Tool with the shortest lifetime.
1: Tool with the small customization data number.
In this case, a customization data number is to be set in parameter No. 13260.

 # 7 TCN Tool life count operation is triggered by:
0: M06/restart M code. (A T code alone does not start counting.)
1: T code. (Count operation is not started by M06.)

13220	Number of valid tools in tool management data

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 64 (Extended to 240 or 1000 by the addition of an option)

This parameter sets the number of valid tools in tool management data.

13221	M code for tool life count restart

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 65535

When 0 is set in this parameter, this parameter is ignored.
When an M code for tool life count restart is specified, the counting of the life of the tool attached at the spindle position is started. When the type for counting the number of use times is selected, the target of life counting is switched to the tool attached at the spindle position, and the life count is incremented by 1.
When the type for counting time is selected, the target of life counting is switched to the tool attached at the spindle position but no other operations are performed. If the tool attached at the spindle position is not a tool under tool life management, no operation is performed.
The M code set in parameter No. 6811 waits for FIN. However, the M code set in this parameter does not wait for FIN.
The M code set in parameter No. 13221 must not be specified in a block where another auxiliary function is specified.
The M code set in parameter No. 13221 does not wait for FIN. So, do not use the M code for other purposes.

13222	Number of data items in the first cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 64 (Extended to 240 or 1000 by the addition of an option)

This parameter sets the number of data items used with the first cartridge.

13223	Start pot number of the first cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 9999

This parameter sets the start pot number to be used with the first cartridge. Pot numbers starting with the value set in this parameter and sequentially incremented by 1 are assigned to all data items.

13227	Number of data items in the second cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 64(Extended to 240 or 1000 by the addition of an option)

This parameter sets the number of data items used with the second cartridge.

13228	Start pot number of the second cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1to9999

This parameter sets the start pot number to be used with the second cartridge. Pot numbers starting with the value set in this parameter and sequentially incremented by 1 are assigned to all data items.

13232	Number of data items in the third cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 64(Extended to 240 or 1000 by the addition of an option)

This parameter sets the number of data items used with the third cartridge.

13233	Start pot number of the third cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1to9999

This parameter sets the start pot number to be used with the third cartridge. Pot numbers starting with the value set in this parameter and sequentially incremented by 1 are assigned to all data items.

13237	Number of data items in the fourth cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1 to 64(Extended to 240 or 1000 by the addition of an option)

This parameter sets the number of data items used with the fourth cartridge.

13238	Start pot number of the fourth cartridge

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 1to9999

This parameter sets the start pot number to be used with the fourth cartridge. Pot numbers starting with the value set in this parameter and sequentially incremented by 1 are assigned to all data items.

	#7	#6	#5	#4	#3	#2	#1	#0
13240					MT4	MT3	MT2	MT1

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Bit system common

 # 0 MT1 The first cartridge is of the:
0: Chain type.
1: Matrix type.
When this parameter is set to 1, parameter No. 13222 is invalid.

 # 1 MT2 The second cartridge is of the:
0: Chain type.
1: Matrix type.
When this parameter is set to 1, parameter No. 13227 is invalid.

 # 2 MT3 The third cartridge is of the:
0: Chain type.
1: Matrix type.
When this parameter is set to 1, parameter No. 13232 is invalid.

 # 3 MT4 The fourth cartridge is of the:
0: Chain type.
1: Matrix type.
When this parameter is set to 1, parameter No. 13237 is invalid.

13241	Number of rows of the first cartridge (when the cartridge is of the matrix type)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the first cartridge is of the matrix type (bit 0 (MT1) of parameter No. 13240 is set to 1), set the number of rows in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13241) × (setting of parameter No. 13242) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the first cartridge is invalid.

13242	Number of columns of the first cartridge (when the cartridge is of the matrix type)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the first cartridge is of the matrix type (bit 0 (MT1) of parameter No. 13240 is set to 1), set the number of columns in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13241) × (setting of parameter No. 13242) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the first cartridge is invalid.

13243	Number of rows of the second cartridge (when the cartridge is of the matrix type)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the second cartridge is of the matrix type (bit 1 (MT2) of parameter No. 13240 is set to 1), set the number of rows in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13243) × (setting of parameter No. 13244) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the second cartridge is invalid.

13244	Number of columns of the second cartridge (when the cartridge is of the matrix type)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the second cartridge is of the matrix type (bit 1 (MT2) of parameter No. 13240 is set to 1), set the number of columns in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13243) × (setting of parameter No. 13244) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the second cartridge is invalid.

13245	Number of rows of the third cartridge (when the cartridge is of the matrix type)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the third cartridge is of the matrix type (bit 2 (MT3) of parameter No. 13240 is set to 1), set the number of rows in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13245) × (setting of parameter No. 13246) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the third cartridge is invalid.

13246	Number of columns of the third cartridge (when the cartridge is of the matrix type)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the third cartridge is of the matrix type (bit 2 (MT3) of parameter No. 13240 is set to 1), set the number of columns in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13245) × (setting of parameter No. 13246) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the third cartridge is invalid.

13247	Number of rows of the fourth cartridge (when the cartridge is of the matrix type)

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the fourth cartridge is of the matrix type (bit 3 (MT4) of parameter No. 13240 is set to 1), set the number of rows in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13247) × (setting of parameter No. 13248) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the fourth cartridge is invalid.

13248	Number of columns of the fourth cartridge (when the cartridge is of the matrix type)

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word
[Valid data range] 0 to 1000

When the fourth cartridge is of the matrix type (bit 3 (MT4) of parameter No. 13240 is set to 1), set the number of columns in the pot in this parameter. The setting must satisfy the following condition, however: The sum total of the value obtained by (setting of parameter No. 13247) × (setting of parameter No. 13248) and the number of pots of other cartridges should not exceed 64 (1000 at maximum). If this condition is not satisfied or this parameter is set to 0, the fourth cartridge is invalid.

13250	Number of valid spindles

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 4
This parameter sets the number of spindle positions usable with the tool management function.

13251	Number of valid standby positions

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 4
This parameter sets the number of standby positions usable with the tool management function.

13252	M code for specifying a particular tool

[Input type] Parameter input
[Data type] Word path
[Valid data range] 0 to 65535

This parameter sets not a tool type number but an M code for directly specifying the T code of a particular tool.

13260	Customization data number to be searched for

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 40

When bit 6 (SWC) of parameter No. 13203 is set to 1, this parameter sets a customization data number to be searched for.
The valid data range is 1 to 4 when the option for customization data extension is not selected. When the option for customization data extension (5 to 20) is selected, the valid data range is 1 to 20. When the option for customization data extension (5 to 40) is selected, the valid data range is 1 to 40.
When bit 6 (SWC) of parameter No. 13203 is set to 0, or a value not within the valid data range is set, the search function based on customization data is disabled, and the tool with the shortest lifetime is searched for.

13265	Number for selecting a spindle position offset number

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 0 to 999

This parameters sets an H/D code for selecting an offset number registered in the data of the tool attached at the spindle position.
When 0 is set, an ordinary used code such as H99/D99 is used. When a value other than 0 is set, H99/D99 no longer has a particular meaning. So, when H99/D99 is specified in this case, the specification of offset number 99 is assumed.
With the T series, address D only is used to specify a tool number and offset number, so that a restriction is imposed on the number of digits. So, the valid data range of this parameter varies according the number of digits of an offset number.
When the number of digits of an offset number is 1: to 9
When the number of digits of an offset number is 2: to 99
When the number of digits of an offset number is 3: to 999

4.70 PARAMETERS OF THE MACHINING CONDITION SELECTION FUNCTION

	#7	#6	#5	#4	#3	#2	#1	#0
13600								MCR

[Input type] Parameter input
[Data type] Bit path

 # 0 MCR When an allowable acceleration rate adjustment is made with the machining condition selection function (machining parameter adjustment screen, precision level selection screen), parameter No. 1735 for the deceleration function based on acceleration in circular interpolation is:
0: Modified.
1: Not modified.

	#7	#6	#5	#4	#3	#2	#1	#0
13601								MPR

[Input type] Parameter input
[Data type] Bit

NOTE
When this parameter is set, the power must be turned off before operation is continued.

 # 0 MPR The machining parameter adjustment screen is:
0: Displayed.
1: Not displayed.
Even when this parameter is set to 1, the precision level selection screen is displayed.

13610	Acceleration rate for acceleration/deceleration before look-ahead interpolation in AI contour control (precision level 1)

13611	Acceleration rate for acceleration/deceleration before look-ahead interpolation in AI contour control (precision level 10)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)

Each of these parameters sets an acceleration rate for acceleration/ deceleration before interpolation in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13612	Acceleration rate change time (bell-shaped) when AI contour control is used (precision level 1)

13613	Acceleration rate change time (bell-shaped) when AI contour control is used (precision level 10)

[Input type] Parameter input
[Data type] Byte path
[Unit of data] msec
[Valid data range] 0 to 200

Each of these parameters sets an acceleration rate change time (bell-shaped) in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13614	**Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration (precision level 1)**

13615	**Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration (precision level 10)**

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)

Each of these parameters sets an allowable acceleration rate change amount per 1 ms for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration during AI contour control.

Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13616	**Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration in successive linear interpolation operations (precision level 1)**

13617	**Allowable acceleration rate change amount for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration in successive linear interpolation operations (precision level 10)**

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)

Each of these parameters sets an allowable acceleration rate change amount per 1 ms for each axis in speed control based on acceleration rate change under control on the rate of change of acceleration in successive linear interpolation operations during AI contour control.

Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

> **NOTE**
> 1 For an axis with 0 set in this parameter, parameter No. 13614 and No. 13615 (allowable acceleration rate change amount in speed control based on acceleration rate change under control on the rate of change of acceleration) are valid.
> 2 For an axis with 0 set in parameter No. 13614 and No. 13615 (allowable acceleration rate change amount in speed control based on acceleration rate change under control on the rate of change of acceleration), speed control based on acceleration rate change is disabled, so that the specification of this parameter has no effect.

13618	**Rate of change time of the rate of change of acceleration in smooth bell-shaped acceleration/deceleration before interpolation when AI contour control is used (precision level 1)**

13619	**Rate of change time of the rate of change of acceleration in smooth bell-shaped acceleration/deceleration before interpolation when AI contour control is used (precision level 10)**

[Input type] Parameter input
[Data type] Byte path
[Unit of data] %
[Valid data range] 0 to 50

Each of these parameters sets the rate (percentage) of the change time of the rate of change of acceleration to the change time of acceleration rate change in smooth bell-shaped acceleration/deceleration before look-ahead interpolation during AI contour control.
Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

> **NOTE**
> When 0 or a value not within the valid data range is set in this parameter, smooth bell-shaped acceleration/deceleration before look-ahead interpolation is not performed.

13620	Allowable acceleration rate when AI contour control is used (precision level 1)

13621	Allowable acceleration rate when AI contour control is used (precision level 10)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/sec/sec, inch/sec/sec, degree/sec/sec (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (D)
(When the machine system is metric system, 0.0 to +100000.0. When the machine system is inch system, machine, 0.0 to +10000.0)

Each of these parameters sets an allowable acceleration rate in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13622	Time constant for acceleration/deceleration after interpolation when AI contour control is used (precision level 1)

13623	Time constant for acceleration/deceleration after interpolation when AI contour control is used (precision level 10)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] msec
[Valid data range] 1 to 512

Each of these parameters sets a time constant for acceleration/deceleration after interpolation when AI contour control is used. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13624	Corner speed difference when AI contour control is used (precision level 1)

13625	Corner speed difference when AI contour control is used (precision level 10)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Each of these parameters sets an allowable speed difference for speed determination based on corner speed difference in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13626	Maximum cutting speed when AI contour control is used (precision level 1)
13627	Maximum cutting speed when AI contour control is used (precision level 10)

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm/min, inch/min, degree/min (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] Refer to the standard parameter setting table (C)
(When the increment system is IS-B, 0.0 to +240000.0)

Each of these parameters sets a maximum cutting speed in AI contour control. Set a value (precision level 1) with emphasis placed on speed, and a value (precision level 10) with emphasis on precision.

13628	Parameter number corresponding to arbitrary item 1 when AI contour control is used
13629	Parameter number corresponding to arbitrary item 2 when AI contour control is used

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] 2-word path
[Valid data range] 1 to 65535

These parameters set the parameter numbers corresponding to arbitrary items 1 and 2.

NOTE
The parameter numbers corresponding to the following cannot be specified:
- Bit parameters
- Spindle parameters (No. 4000 to No. 4799)
- Parameters of real number type
- Parameters that require power-off (for which the alarm (PW0000) is issued)
- Nonexistent parameters

13630	**Value with emphasis on speed (precision level 1) of the parameter corresponding to arbitrary item 1 when AI contour control is used**

13631	**Value with emphasis on speed (precision level 1) of the parameter corresponding to arbitrary item 2 when AI contour control is used**

13632	**Value with emphasis on speed (precision level 10) of the parameter corresponding to arbitrary item 1 when AI contour control is used**

13633	**Value with emphasis on speed (precision level 10) of the parameter corresponding to arbitrary item 2 when AI contour control is used**

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Depend on the type of parameter for an arbitrary item
[Valid data range] Depend on the type of parameter for an arbitrary item

Each of these parameters sets a value with emphasis placed on speed or precision for a parameter.

13634	**Precision level currently selected when AI contour control is used**

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 10

This parameter sets the level currently selected.

4.71 PARAMETER OF LINEAR SCALE WITH ABSOLUTE ADDRESS REFERENCE POSITION

14010	Maximum allowable travel distance when the reference position is established for a linear scale with an absolute address reference position

[Input type] Parameter input
[Data type] 2-word axis
[Unit of data] Detection unit
[Valid data range] 0 to 99999999

This parameter sets the maximum allowable travel distance at the FL feedrate when the reference position is established for a linear scale with an absolute address reference position. When the travel distance exceeds the setting of this parameter, the alarm (PS5326) (SCALE WITH REFERENCE POSITION: REFERENCE POSITION ESTABLISHMENT FAILED) is issued. When this parameter is set to 0, the maximum allowable travel distance is not checked.

4.72 PARAMETERS OF FSSB

14340	ATR value corresponding to slave 01 on FSSB line 1
14341	ATR value corresponding to slave 02 on FSSB line 1
	:
14357	ATR value corresponding to slave 18 on FSSB line 1

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0to23,64,-56,-96

Each of these parameters sets the value (ATR value) of the address translation table corresponding to each of slave 1 to slave 18 on FSSB line 1 (first optical connector).
The slave is a generic term for servo amplifiers and separate detector interface units connected via an FSSB optical cable to the CNC. Numbers 1 to 18 are assigned to slaves, with younger numbers sequentially assigned to slaves closer to the CNC.
A 2-axis amplifier consists of two slaves, and a 3-axis amplifier consists of three slaves. In each of these parameters, set a value as described below, depending on whether the slave is an amplifier, separate detector, or nonexistent.

- When the slave is an amplifier:
  Set a value obtained by subtracting 1 from the setting of parameter No. 1023 for the axis to which the amplifier is assigned.
- When the slave is a separate detector interface unit:
  Set 64 for the first separate detector interface unit (connected near the CNC), and set -56 for the second separate detector interface unit (connected far from the CNC).
- When the slave is nonexistent:
  Set -96.

NOTE

1. When the electric gear box (EGB) function is used Although an amplifier is not actually required for an EGB dummy axis, set this parameter with assuming that a dummy amplifier is connected. That is, as the address conversion table value for a nonexistent slave, set the value obtained by subtracting 1 from the setting of parameter No. 1023 for the EGB dummy axis, instead of -96.
2. When the FSSB is set to the automatic setting mode (when the parameter FMD (No.1902#0) is set to 0), parameter Nos. 14340 to 14357 are automatically set as data is input on the FSSB setting screen. When the manual setting 2 mode is set (when the parameter FMD (No.1902#0) is set to 1), be sure to directly set values in parameter Nos. 14340 to 14357.

Example of axis configuration and parameter settings

Example 1

CNC

Controlled axis number	Program axis name No.1020	Servo axis No.1023
1	X	1
2	Y	3
3	Z	4
4	A	2
5	B	5
6	C	6

	Slave number	ATR No.14340 to 14357	Axis
Single-axis amplifier	1	0	X
Two-axis amplifier	2	1	A
	3	2	Y
Two-axis amplifier	4	3	Z
	5	4	B
M1	6	64	(M1)
Single-axis amplifier	7	5	C
M2	8	-56	(M2)
	9 to 18	-96	(None)

CNC

Controlled axis number	Program axis name No.1020	Servo axis No.1023
1	X	1
2	Y	3
3	Z	4
4	A	2
5	B	5
6	C	6

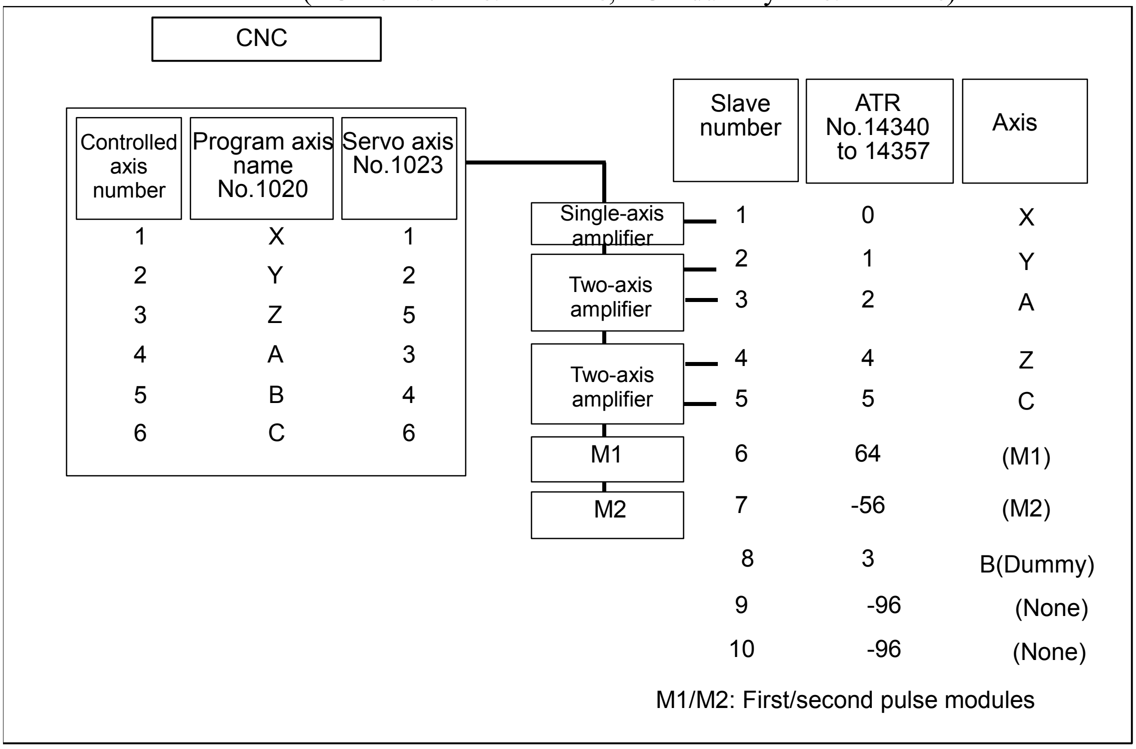
	Slave number	ATR No.14340 to 14357	Axis
Single-axis amplifier	1	0	X
Two-axis amplifier	2	2	Y
	3	3	Z
Two-axis amplifier	4	1	A
	5	4	B
M1	6	64	(M1)
Single-axis amplifier	7	5	C
M2	8	-56	(M2)
	9 to 18	-96	(None)

M1/M2: First/second pulse modules

Example 2

Example of axis configuration and parameter settings when the electric gear box (EGB) function is used

(EGB slave axis: A-axis, EGB dummy axis: B-axis)



14358	ASTR value corresponding to slave 01 on FSSB line 2
14359	ASTR value corresponding to slave 02 on FSSB line 2
:	
14375	ASTR value corresponding to slave 18 on FSSB line 2

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0to23,80,-40,-96

Each of these parameters sets the value (ATR value) of the address translation table corresponding to each of slave 1 to slave 18 on FSSB line 2 (second optical connector).

- When the slave is an amplifier:
  Set a value obtained by subtracting 1 from the setting of parameter No. 1023 for the axis to which the amplifier is assigned.
- When the slave is a separate detector interface unit:
  Set 80 for the third separate detector interface unit (connected near the CNC), and set -40 for the fourth separate detector interface unit (connected far from the CNC).
- When the slave is nonexistent:
  Set -96.

> **NOTE**
> 1 Set these parameters only when a servo axis control card with two optical connectors (FSSB lines) is used.
> 2 When the FSSB is set to the automatic setting mode (when the parameter FMD (No.1902#0) is set to 0), parameter Nos. 14358 to 14375 are automatically set as data is input on the FSSB setting screen. When the manual setting 2 mode is set (when the parameter FMD (No.1902#0) is set to 1), be sure to directly set values in parameter Nos. 14358 to 14375.

14376	**ATR value corresponding to connector 1 on the first separate detector interface unit**
14377	**ATR value corresponding to connector 2 on the first separate detector interface unit**
:	
14383	**ATR value corresponding to connector 8 on the first separate detector interface unit**
14384	**ATR value corresponding to connector 1 on the second separate detector interface unit**
:	
14391	**ATR value corresponding to connector 8 on the second separate detector interface unit**
14392	**ATR value corresponding to connector 1 on the third separate detector interface unit**
:	
14399	**ATR value corresponding to connector 8 on the third separate detector interface unit**
14400	**ATR value corresponding to connector 1 on the fourth separate detector interface unit**
:	
14407	**ATR value corresponding to connector 8 on the fourth separate detector interface unit**

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 32

Each of these parameters sets the value (ATR value) of the address translation table corresponding to each connector on a separate detector interface unit.

The first and second separate detector interface units are connected to FSSB line 1, and the third and fourth separate detector interface units are connected to FSSB line 2.

In each of these parameters, set a value obtained by subtracting 1 from the setting of parameter No. 1023 for the axis connected to a connector on a separate detector interface unit.

When there is an axis for which bit 1 of parameter No. 1815 is set to 0 to use a separate detector interface unit, set 32 for those connectors that are not used.

> **NOTE**
> When the FSSB is set to the automatic setting mode (when the parameter FMD (No.1902#0) is set to 0), parameter Nos. 14376 to 14407 are automatically set as data is input on the FSSB setting screen. When the manual setting 2 mode is set (when the parameter FMD (No.1902#0) is set to 1), be sure to directly set values in parameter Nos. 14376 to 14407.

14408	ATR value corresponding to slave 01 on an additional axis board
14409	ATR value corresponding to slave 02 on an additional axis board
	:
14425	ATR value corresponding to slave 18 on an additional axis board

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0to23,64,-56,-96

Each of these parameters sets the value (ATR value) of the address translation table corresponding to each of slave 1 to slave 18 on an additional axis board.

- When the slave is an amplifier:
  Set a value obtained by subtracting 25 from the setting of parameter No. 1023 for the axis to which the amplifier is assigned.
- When the slave is a separate detector interface unit:
  Set 64 for the first separate detector interface unit (connected near the CNC), and set -56 for the second separate detector interface unit (connected far from the CNC).
- When the slave is nonexistent:
  Set -96.

> **NOTE**
> 1 Set these parameters when using an additional axis board.
> 2 When the FSSB is set to the automatic setting mode (when the parameter FMD (No.1902#0) is set to 0), parameter Nos. 14408 to 14425 are automatically set as data is input on the FSSB setting screen. When the manual setting 2 mode is set (when the parameter FMD (No.1902#0) is set to 1), be sure to directly set values in parameter Nos. 14408 to 14425.

14444	**ATR value corresponding to connector 1 on the first separate detector interface unit connected to an additional axis board**
14445	**ATR value corresponding to connector 2 on the first separate detector interface unit connected to an additional axis board**
	:
14451	**ATR value corresponding to connector 8 on the first separate detector interface unit connected to an additional axis board**
14452	**ATR value corresponding to connector 1 on the second separate detector interface unit connected to an additional axis board**
	:
14459	**ATR value corresponding to connector 8 on the second separate detector interface unit connected to an additional axis board**

NOTE

When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Byte
[Valid data range] 0 to 32

Each of these parameters sets the value (ATR value) of the address translation table corresponding to each connector on a separate detector interface unit connected to an additional axis board.

To an additional axis board, the first and second separate detector interface units are connected.

In each of these parameters, set a value obtained by subtracting 25 from the setting of parameter No. 1023 for the axis connected to a connector on a separate detector interface unit.

When there is an axis for which bit 1 of parameter No. 1815 is set to 0 to use a separate detector interface unit, set 32 for those connectors that are not used.

NOTE

1 Set these parameters when using an additional axis board.

2 When the FSSB is set to the automatic setting mode (when the parameter FMD (No.1902#0) is set to 0), parameter Nos. 14444 to 14459 are automatically set as data is input on the FSSB setting screen. When the manual setting 2 mode is set (when the parameter FMD (No.1902#0) is set to 1), be sure to directly set values in parameter Nos. 14444 to 14459.

	#7	#6	#5	#4	#3	#2	#1	#0
14476							2AX	

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Bit

 # 1 2AX Servo software 90Dx series for servo HRV4 control is:
0: Not used.
1: Used.

4.73 PARAMETERS OF PERIODICAL SECONDARY PITCH COMPENSATION

14985	Number of the periodical secondary pitch compensation position at the extremely negative position for each axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1535

The compensation position set in this parameter is used as the reference point for periodical secondary pitch error compensation. This reference point is used as the compensation position at the reference position.
The compensation at the reference point must be 0.

14986	Number of the periodical secondary pitch compensation position at the extremely positive position for each axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Word axis
[Valid data range] 0 to 1535

This parameter sets the periodical secondary pitch compensation position at the extremely positive position for each axis.

14987	Interval between periodical secondary pitch compensation positions for each axis

NOTE
When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch, deg (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 0 to interval between stored pitch error compensation positions (parameter No. 3624)

This parameter sets the interval between periodical secondary pitch compensation positions for each axis.

14988	Magnification for periodical secondary pitch error compensation for each axis

> **NOTE**
> When this parameter is set, the power must be turned off before operation is continued.

[Input type] Parameter input
[Data type] Integer axis
[Valid data range] 0 to 100

This parameter sets the magnificaiton for periodical secondary pitch error compensation for each axis.
If the magnification is set to 1, the same unit as the detection unit is used for the compensation data.

4.74 PARAMETERS OF AI CONTOUR CONTROL

	#7	#6	#5	#4	#3	#2	#1	#0
19500	FCC	FNW						

[Input type] Parameter input
[Data type] Bit path

 # 6 FNW When the feedrate is determined according to the feedrate difference and acceleration in AI contour control:

0: The maximum feedrate at which the allowable feedrate difference and acceleration for each axis are not exceeded is used.

1: The maximum feedrate at which the allowable feedrate difference and acceleration for each axis are not exceeded is used. The feedrate is determined so that the decreased feedrate is constant regardless of the move direction when the profile is the same.

A feedrate is determined to satisfy the condition that the allowable feedrate difference and allowable acceleration rate of each axis are not exceeded, and also to ensure that a constant deceleration rate is applied to the same figure regardless of the direction of movement.

 # 7 FCC When there is an axis that requires one or more seconds for acceleration in acceleration/deceleration before look-ahead interpolation:

0: Emphasis is placed on precision, so that the specified feedrate may not be reached.

1: Emphasis is placed on speed, so that the specified feedrate is produced.

When this parameter is set to 1, the precision of curved interpolation such as circular interpolation and NURBS interpolation may decrease.

	#7	#6	#5	#4	#3	#2	#1	#0
19501			FRP					

[Input type] Parameter input
[Data type] Bit path

 # 5 FRP Linear rapid traverse is:
0: Acceleration/deceleration after interpolation
1: Acceleration/deceleration before interpolation
Set a maximum allowable acceleration rate for each axis in parameter No. 1671.
When using bell-shaped acceleration/deceleration before interpolation, set an acceleration rate change time in parameter No. 1672.

When this parameter is set to 1, acceleration/deceleration before interpolation is also applied to rapid traverse if all conditions below are satisfied. At this time, acceleration/deceleration after interpolation is not applied.

- Bit 1 (LRP) of parameter No. 1401 is set to 1: Linear interpolation type positioning
- A value other than 0 is set in parameter No. 1671 for an axis.
- The AI contour control mode is set.

If all of these conditions are not satisfied, acceleration/deceleration after interpolation is applied.

	#7	#6	#5	#4	#3	#2	#1	#0
19503				ZOL				HPF

[Input type] Parameter input
[Data type] Bit path

 # 0 HPF When a feedrate is determined based on acceleration in AI contour control, smooth feedrate control is:
0: Not used.
1: Used.

 # 4 ZOL The deceleration function based on cutting load in AI contour control (deceleration based on Z-axis fall angle) is:
0: Enabled for all commands.
1: Enabled for linear interpolation commands only.

	#7	#6	#5	#4	#3	#2	#1	#0
19515							ZG2	BEX

[Input type] Parameter input
[Data type] Bit path

 # 0 BEX When the tapping mode (G63) or a canned cycle is specified, the mode for acceleration/deceleration before look-ahead interpolation is:
0: Turned off.
1: Not turned off.

 # 1 ZG2 When the deceleration function based on cutting load in AI contour control (deceleration based on Z-axis fall angle) is used:
0: Stepwise override values are applied.
1: Inclined override values are applied.
This parameter is valid only when bit 4 (ZAG) of parameter No. 8451 is set to 1.
When this parameter is set to 1, be sure to set parameter Nos. 19516, 8456, 8457, and 8458.

19516	Override for area 1 in deceleration based on cutting load in AI contour control

[Input type] Parameter input
[Data type] Word path
[Unit of data] %
[Valid data range] 1 to 100
This parameter sets an override value for area 1 when the deceleration function based on cutting load in AI contour control is used.
This parameter is valid only when bit 1 (ZG2) of parameter No. 19515 is set to 1.

4.75 PARAMETERS OF CYLINDRICAL INTERPOLATION

	#7	#6	#5	#4	#3	#2	#1	#0
19530		CYS	CYA					

[Input type] Parameter input
[Data type] Bit path

 # 5 CYA Specifies whether to perform cylindrical interpolation cutting point compensation in the cylindrical interpolation command (G07.1).
0: Perform.
1: Do not perform.

 # 6 CYS Specifies whether when the cylindrical interpolation cutting point compensation function is used, cutting point compensation is performed between blocks or together with a block movement if the cutting point compensation value is less than the setting of parameter No. 19534.
0: Performed between blocks.
1: Performed together with a block movement if the cutting point compensation value is less than the setting of parameter No. 19534.

19531	Tool offset axis number for the XY plane
19532	Tool offset axis number for the ZX plane
19533	Tool offset axis number for the YZ plane

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to number of controlled axes
Specify a tool offset axis that intersects the cylindrical rotation axis at right angles.

19534	Limit for changing cylindrical interpolation cutting point compensation in a single block

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (input unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 1 to 999999999

The following operation is performed, depending on the setting of parameter No.19530:

1) Parameter CYS (bit 6 of No. 19530) is set to 0
   If the amount of cylindrical interpolation cutting point compensation is smaller than the value set in this parameter, cylindrical interpolation cutting point compensation is not performed. Instead, this ignored amount of cylindrical interpolation cutting point compensation is added to the next amount of cylindrical interpolation cutting point compensation to determine whether to perform cylindrical interpolation cutting point compensation.

2) Parameter CYS (bit 6 of No. 19530) is set to 1
   If the amount of cylindrical interpolation cutting point compensation is smaller than the value set in this parameter, cylindrical interpolation cutting point compensation is performed together with the movement of the specified block.

NOTE
Set this parameter as follows:
Setting > (setting for a rotation axis in parameter No. 1422) × 4/3 where 4/3 is a constant for internal processing.

19535	**Limit of travel distance moved with the cylindrical interpolation cutting point compensation in the previous block unchanged.**

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm, inch (input unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	1 to 999999999

The following operation is performed, depending on the type of interpolation:

1) For linear interpolation
   If the travel distance in a specified block is smaller than the value set in this parameter, machining is performed without changing the cylindrical interpolation cutting point compensation in the previous block.
2) For circular interpolation
   If the diameter of a specified arc is smaller than the value set in this parameter, machining is performed without changing the cylindrical interpolation cutting point compensation in the previous block. Cylindrical interpolation cutting point compensation is not performed according to a circular movement.

4.76 PARAMETERS OF OPTIMAL TORQUE ACCELERATION/DECELERATION

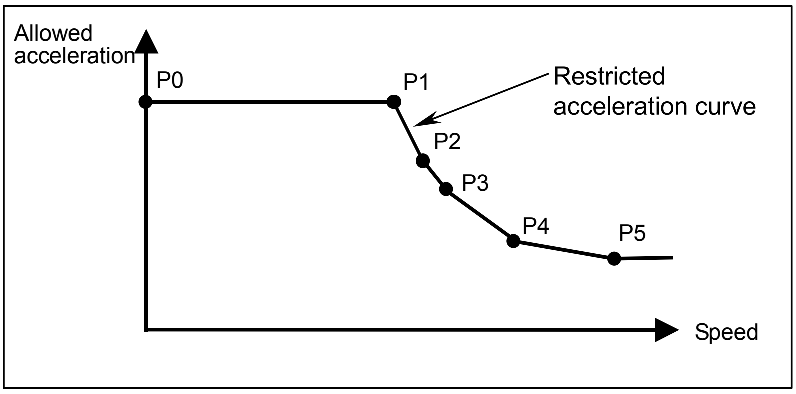
	#7	#6	#5	#4	#3	#2	#1	#0
19540								FAP

[Input type] Parameter input
[Data type] Bit path

 # 0 FAP Optimal torque acceleration/deceleration is:
0: Disabled.
1: Enabled.

When the linear positioning parameters, namely bit 1 (LRP) of parameter No. 1401 and bit 0 (FAP) of parameter No. 19540, are set to 1, and a value other than 0 is set in reference acceleration parameter (No. 1671) for an axis, the acceleration/deceleration for rapid traverse becomes optimal torque acceleration/deceleration in the mode for acceleration/deceleration before look-ahead interpolation (or the AI contour control mode). Optimal torque acceleration/ deceleration is controlled according to parameter-set restricted acceleration curve data.

Setting of restricted acceleration curve data



For each travel direction and each acceleration/deceleration operation, set the speed and allowable acceleration rate at each of the acceleration setting points (P0 to P5) for each axis in parameters. Set speeds in the speed parameters (No. 19541 to No. 19543). Set allowable acceleration rates in the allowable acceleration parameters (No. 19545 to No. 19568).

19541	Optimal torque acceleration/deceleration (speed at P1)
19542	Optimal torque acceleration/deceleration (speed at P2)
19543	Optimal torque acceleration/deceleration (speed at P3)
19544	Optimal torque acceleration/deceleration (speed at P4)

[Input type] Parameter input
[Data type] Word axis
[Unit of data] 0.01%
[Valid data range] 0 to 10000

The speeds at acceleration setting points P1 to P4 are to be set with speed parameters Nos. 19541 to 19544 as ratios to the rapid traverse speed (parameter No. 1420). The speed at P0 is 0, and the speed at P5 is the rapid traverse rate specified with parameter (No. 1420). Any acceleration setting point for which the speed parameter (one of Nos. 19541 to 19544) is set to 0 will be skipped.

19545	Optimal torque acceleration/deceleration (acceleration at P0 during movement in + direction and acceleration)
19546	Optimal torque acceleration/deceleration (acceleration at P1 during movement in + direction and acceleration)
19547	Optimal torque acceleration/deceleration (acceleration at P2 during movement in + direction and acceleration)
19548	Optimal torque acceleration/deceleration (acceleration at P3 during movement in + direction and acceleration)
19549	Optimal torque acceleration/deceleration (acceleration at P4 during movement in + direction and acceleration)
19550	Optimal torque acceleration/deceleration (acceleration at P5 during movement in + direction and acceleration)
19551	Optimal torque acceleration/deceleration (acceleration at P0 during movement in - direction and acceleration)
19552	Optimal torque acceleration/deceleration (acceleration at P1 during movement in - direction and acceleration)
19553	Optimal torque acceleration/deceleration (acceleration at P2 during movement in - direction and acceleration)
19554	Optimal torque acceleration/deceleration (acceleration at P3 during movement in - direction and acceleration)
19555	Optimal torque acceleration/deceleration (acceleration at P4 during movement in - direction and acceleration)
19556	Optimal torque acceleration/deceleration (acceleration at P5 during movement in - direction and acceleration)
19557	Optimal torque acceleration/deceleration (acceleration at P0 during movement in + direction and deceleration)
19558	Optimal torque acceleration/deceleration (acceleration at P1 during movement in + direction and deceleration)
19559	Optimal torque acceleration/deceleration (acceleration at P2 during movement in + direction and deceleration)
19560	Optimal torque acceleration/deceleration (acceleration at P3 during movement in + direction and deceleration)

19561	**Optimal torque acceleration/deceleration (acceleration at P4 during movement in + direction and deceleration)**

19562	**Optimal torque acceleration/deceleration (acceleration at P5 during movement in + direction and deceleration)**

19563	**Optimal torque acceleration/deceleration (acceleration at P0 during movement in - direction and deceleration)**

19564	**Optimal torque acceleration/deceleration (acceleration at P1 during movement in - direction and deceleration)**

19565	**Optimal torque acceleration/deceleration (acceleration at P2 during movement in - direction and deceleration)**

19566	**Optimal torque acceleration/deceleration (acceleration at P3 during movement in - direction and deceleration)**

19567	**Optimal torque acceleration/deceleration (acceleration at P3 during movement in - direction and deceleration)**

19568	**Optimal torque acceleration/deceleration (acceleration at P5 during movement in - direction and deceleration)**

[Input type] Parameter input
[Data type] Word axis
[Unit of data] 0.01%
[Valid data range] 0 to 32767

For each travel direction and each acceleration/deceleration operation, set the allowable acceleration rate at each of the acceleration setting points (P0 to P5). As an allowable acceleration rate, set a ratio to the value set in the reference acceleration parameter (No. 1671). When 0 is set, the specification of 100% is assumed.

4.77 PARAMETERS OF NANO SMOOTHING

19581	Tolerance smoothing for nano smoothing

[Input type]	Setting input
[Data type]	Real path
[Unit of data]	mm, inch, degree (input unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B)) (When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets a tolerance value for a program created using miniature line segments in nano smoothing.

When 0 is set in this parameter, a minimum amount of travel in the increment system is regarded as a tolerance value.

19582	Minimum amount of travel of a block that makes a decision based on an angular difference between blocks for nano smoothing

[Input type]	Setting input
[Data type]	Real path
[Unit of data]	mm, inch, degree (input unit)
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	0 or positive 9 digit of minimum unit of data (refer to the standard parameter setting table (B)) (When the increment system is IS-B, 0.0 to +999999.999)

This parameter sets the minimum amount of travel of a block that makes a decision based on an angular difference between blocks for nano smoothing. A block that specifies an amount of travel less than the value set in this parameter makes no decision based on an angular difference.

When 0 is set in this parameter, a decision based on an angular difference is made with all blocks.

A value greater than the value set in parameter No. 8490 for making a decision based on the minimum travel distance of a block must be set.

4.78 PARAMETERS OF TOOL COMPENSATION (2 OF 2)

	#7	#6	#5	#4	#3	#2	#1	#0
19607	NAG	NAA	CAV			CCC	SPG	
	NAG	NAA	CAV			CCC	SPG	

[Input type] Parameter input
[Data type] Bit path

 # 1 SPG To apply cutter compensation for 5-axis machining to a machine having a table rotation axis, as the G code to be specified:
0: G41.2/G42.2 is used regardless of the machine type.
1: G41.4/G42.4 is used for a table rotation type machine; G41.5/G42.5 for a mixed type machine.

 # 2 CCC In the cutter compensation/tool nose radius compensation mode, the outer corner connection method is based on:
0: Linear connection type.
1: Circular connection type.

 # 5 CAV When an interference check finds that interference (overcutting) occurred:
0: Machining stops with the alarm (PS0041).
(Interference check alarm function)
1: Machining is continued by changing the tool path to prevent interference (overcutting) from occurring. (Interference check avoidance function)
For the interference check method, see the descriptions of bit 1 (CNC) of parameter No. 5008 and bit 3 (CNV) of parameter No. 5008.

 # 6 NAA When the interference check avoidance function considers that an avoidance operation is dangerous or that a further interference to the interference avoidance vector occurs:
0: An alarm is issued.
When an avoidance operation is considered to be dangerous, the alarm (PS5447) is issued.
When a further interference to the interference avoidance vector is considered to occur, the alarm (PS5448) is issued.
1: No alarm is issued, and the avoidance operation is continued.

NOTE
Usually, set this parameter to 0.

 # 7 NAG If the gap vector length is 0 when the interference check avoidance function for cutter compensation/tool nose radius compensation is used:
0: Avoidance operation is performed.
1: Avoidance operation is not performed.

	#7	#6	#5	#4	#3	#2	#1	#0
19608	HEL	MIR	PRI			DET	NI5	

[Input type] Parameter input
[Data type] Bit path

#1 NI5 For an interference check of cutter compensation for 5-axis machining:
0: The specified position in the workpiece coordinate system and compensation vector are used.
The interference check avoidance function cannot be used.
1: The position at which the programmed command specified with the table coordinate system is focused onto the plane normal to the tool axis direction and the compensation vector are used.
The interference check avoidance function can be used.

 # 2 DET When the programming coordinate system is fastened to the table in tool tip point control for 5-axis machining or cutter compensation for 5-axis, the relative position and absolute position of a specified path are:
0: Displayed in the programming coordinate system (fastened to the table).
1: Displayed in the workpiece coordinate system (not fastened to the table).

 # 5 PRI Among multiple end point candidates that exist when a movement is made on a rotation axis by a command such as I, J, and K when a slanted surface machining command is specified under tool tip point control for 5-axis machining (type 2) or cutter compensation for 5-axis (type 2):
0: A combination in which the master (first rotation axis) makes a smaller angular movement is selected for a machine of tool rotation type or table rotation type. A combination in which the table (second rotation axis) makes a smaller angular movement is selected for a machine of composite type.
1: A combination in which the slave (second rotation axis) makes a smaller angular movement is selected for a machine of tool rotation type or table rotation type. A combination in which the tool (first rotation axis) makes a smaller angular movement is selected for a machine of composite type.

 # 6 MIR When programmable mirror image is applied to a linear axis in tool tip point control for 5-axis machining (type 2) or cutter compensation for 5-axis (type 2), mirror image is:
0: Not applied to a specified I, J, or K command
1: Applied to a specified I, J, or K command.

 # 7 HEL When the tool is tilted toward the forward move direction by a Q command in tool tip point control for 5-axis machining (type 2), a helical interpolation block:
0: Tilts the tool in the direction of the tangent to the arc (at the block end point).

1: Tilts the tool toward the forward move direction involving the helical axis (at the block end point).

	#7	#6	#5	#4	#3	#2	#1	#0
19609							CCT	

[Input type] Parameter input
[Data type] Bit path

 # 1 CCT The cancellation of the G codes in group 08 is:
0: Specified by G49.
1: Able to be specified by G49.1 as well.
If G49 is specified when cancellation using G49.1 is set, the G codes of group 08 are canceled.

19625	Number of blocks to be read in the cutter compensation/tool nose radius compensation mode

[Input type] Setting input
[Data type] Byte path
[Valid data range] 3 to 8

This parameter sets the number of blocks to be read in the cutter compensation/tool nose radius compensation mode. When a value less than 3 is set, the specification of 3 is assumed. When a value greater than 8 is set, the specification of 8 is assumed. As a greater number of blocks are read, an overcutting (interference) forecast can be made with a command farther ahead. However, the number of blocks read and analyzed increases, so that a longer block processing time becomes necessary.

Even if the setting of this parameter is modified in the MDI mode by stopping in the cutter compensation/tool nose radius compensation mode, the setting does not become valid immediately. Before the new setting of this parameter can become valid, the cutter compensation/tool noise radius compensation mode must be canceled, then the mode must be entered again.

19636	Angle used to determine whether to execute the interference check/avoidance function of cutter compensation for 5-axis machining

[Input type]	Setting input
[Data type]	Real path
[Unit of data]	deg
[Minimum unit of data]	Depend on the increment system of the reference axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A))

The interference check/avoidance function of cutter compensation for 5-axis machining is executed when the angle difference between the tool direction vectors for the target two points is less than the setting.

This parameter is valid when bit 1 (NI5) of parameter No. 19608 is set to 1. When the setting is 0, the angle is assumed to be 10.0 degrees.

4.79 PARAMETERS OF 5-AXIS MACHINING FUNCTION

	#7	#6	#5	#4	#3	#2	#1	#0
19650							RAP	RAM

[Input type] Parameter input
[Data type] Bit axis

 # 0 RAM For a tool axis direction tool length compensation function, rotation axes are:
0: Not used.
1: Used.
Select and set two rotation axes.

 # 1 RAP Rotation axes used for the tool axis direction tool length compensation function are:
0: Ordinary rotation axes.
1: Parameter axes.
When 0 is set, absolute coordinates are used as the coordinates of rotation axes in tool axis direction tool length compensation. When 1 is set, the value set in parameter No. 19658 is used as the coordinates of the rotation axes.
When there is no rotation axis or only one rotation axis in the controlled axes, set 1 in bits 0 (RAM) and 1 (RAP) of parameter No. 19650 for the linear axes to which non-existent rotation axes belong and set an angular displacement in parameter No. 19658.

(Example 1)
There are linear axes X, Y, and Z, and rotation axes A, B, and C which rotate about the X-, Y-, and Z-axes, respectively. The tool axis direction is controlled with the rotation axes A and C.

	Parameter RAM (No.19650#0)
X	0
Y	0
Z	0
A	1
B	0
C	1

(Example 2)
The controlled axes include only the linear axes X, Y, and Z. By using the tool attachment, the tool axis is tilted in the same tool axis direction as when the A- and C-axes are rotated.

	Parameter RAM (No.19650#0)	Parameter RAP (No.19650#1)	Angular displacement of rotation axis (No.19658)
X	1	1	45.0

Y	0	0	0.0
Z	1	1	30.0

19655	Axis number of the linear axis to which a rotation axis belongs

[Input type] Parameter input
[Data type] Byte axis
[Valid data range] 0 to Number to controlled axes

Set this parameter to use the tool axis direction tool length compensation function.
When a rotation axis rotates about a linear axis, the linear axis is referred to as an axis to which the rotation axis belongs, and is set using this parameter. For a rotation axis that belongs to no linear axis or for a linear axis, set 0.

(Example)
Axis configuration: X, Y, Z, C, and A
Linear axes: X, Y, and Z
Rotation axes: A (rotating about the X-axis) and C (rotating about the Z-axis)
In the above case, set the following:

Axis number	Axis name	Setting
1	X	0
2	Z	0
3	Y	0
4	C	2
5	A	1

19656	Tool axis direction

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 1 to 3

Enter the tool axis direction when the two rotation axes are set at 0 degrees.

Data	Tool axis direction
1	X-axis
2	Y-axis
3	Z-axis

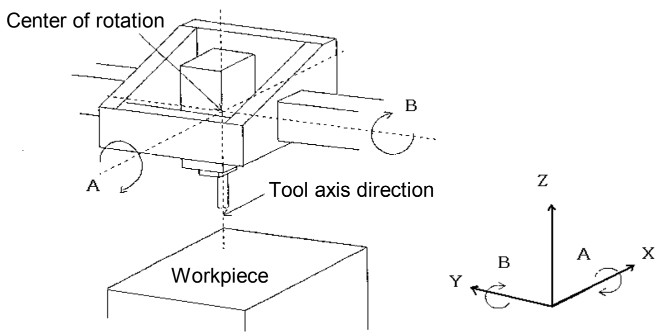
19657	Master rotation axis number

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number to controlled axes

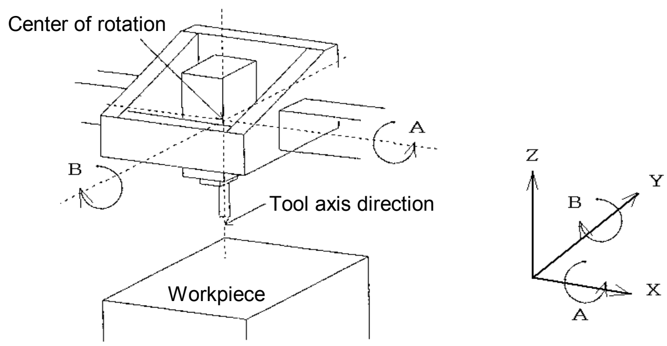
When a machine does not have the rotation axis that rotates about the tool axis, this parameter sets the axis number of a rotation axis used as the master axis. For a machine not using the master-axis configuration, set 0.

When the tool axis direction is controlled by two rotation axes, neither of which rotates about the tool axis, one of the rotation axes is mounted on the other rotation axis as shown in the figure below. In this case, the rotation axis on which the other rotation axis is mounted is called the master axis.

A- and B-axes (The tool axis is the Z-axis and the B-axis is the master.)



A- and B-axes (The tool axis is the Z-axis and the A-axis is the master.)



Example of setting parameters that determine the machine configuration

Tool axis direction: Z-axis
Axis configuration: W, X, Y, Z, A, and B
Rotation axes: A-axis (rotating about the X-axis) and B-axis (rotating about the Y-axis)
Master axis: A-axis

Parameter number	Data					
No.19655	X	Y	Z	W	A	B
	0	0	0	0	1	2
No.19656	3					
No.19657	5					

19658	Angular displacement of a rotation axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the coordinate of a rotation axis, among the rotation axes determining the tool axis direction, which is not controlled by the CNC for the tool axis direction tool length compensation function. Whether this parameter is valid or invalid is determined by the setting of bit 1 (RAP) of parameter No. 19650.

19659	Offset value for the angular displacement of a rotation axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

An offset can be applied to the angular displacement for the tool axis direction tool length compensation function to compensate for the move direction.

19660	Origin offset value of a rotation axis

[Input type] Parameter input
[Data type] Real axis
[Unit of data] deg
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets an angular displacement shifted from the origin for a rotation axis for the tool axis direction tool length compensation function.

19661	Rotation center compensation vector in tool axis direction tool length compensation

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the vector from the first rotation axis center to the second rotation axis center for the tool axis direction tool length compensation function.

19662	Spindle center compensation vector in tool axis direction tool length compensation

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

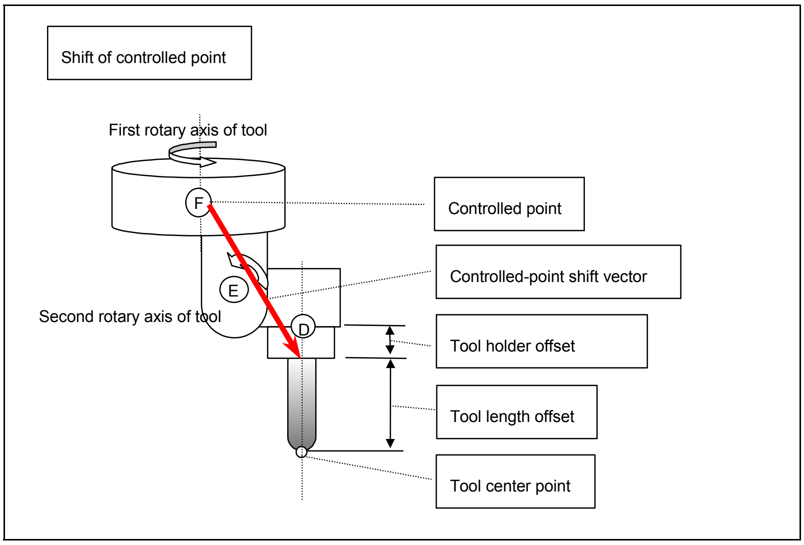
This parameter sets the compensation vector for the spindle center for the tool axis direction tool length compensation function.

	#7	#6	#5	#4	#3	#2	#1	#0
19665	ETH		SVC	SPR				

[Input type] Parameter input
[Data type] Bit path

 # 4 SPR The controlled point is shifted by:
0: Automatic calculation.
1: Using parameter No. 19667.

SVC (bit 5 of parameter No. 19665)	SPR (bit 4 of parameter No. 19665)	Shift of controlled point
0	-	Shift is not performed as not done conventionally.
1	0	The controlled point is shifted according to the result of the following automatic calculation: - (Intersection offset vector between the tool axis and the first rotation axis of the tool + intersection offset vector between the second and first rotation axes of the tool + tool holder offset (parameter No. 19666)) (See the figure below.)
1	1	The controlled point is shifted. As the shift vector, the vector set in parameter No. 19667 is used.



[Controlled-point shift vector when automatically calculated]

 # 5 **SVC** The controlled point is:

0: Not shifted.

1: Shifted.

The method of shifting is specified by bit 4 (SPR) of parameter No. 19665.

> **NOTE**
> When the machine has no rotation axis for rotating the tool (when parameter No. 19680 is set to 12 to specify the table rotation type), the controlled point is not shifted regardless of the setting of this parameter.

 # 7 **ETH** The tool holder offset function in tool length compensation is:

0: Disabled.

1: Enabled.

19666	Tool holder offset value

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

When the tool axis direction tool length compensation function, tool tip center rotation handle feed/interrupt, and the display of the tool center point position are performed, specify the offset for the machine-specific section from the rotation center of the rotation axis to the tool mounting position (the tool holder offset value) in tool length compensation during tool center point control, tool center point control for 5-axis machining, and tilted working plane command mode (after G53.1). For the tool axis direction tool length compensation function, the tool holder offset function can be enabled or disabled by setting bit 7 (ETH) of parameter No. 19665.

NOTE
Set a radius value.

19667	Controlled-point shift vector

[Input type] Parameter input
[Data type] Real axis
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set the shift vector for the controlled point. This value becomes valid when bit 5 (SVC) of parameter No. 19665 is set to 1, and bit 4 (SPR) of parameter No. 19665 is set to 1.

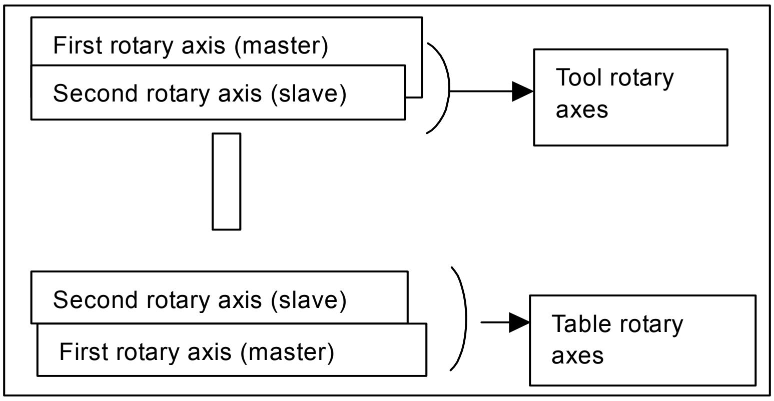
NOTE
Set a radius value.

19680	Mechanical unit type

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 21

Specify the type of the mechanical unit.

Parameter No. 19680	Mechanical unit type	Controlled rotation axis	Master and slave
0		Mechanism having no rotation axis	
2	Tool rotation type	Two rotation axes of the tool	The first rotation axis is the master, and the second rotation axis is the slave.
12	Table rotation type	Two rotation axes of the table	The first rotation axis is the master, and the second rotation axis is the slave.
21	Mixed type	One rotation axis of the tool + one rotation axis of the table	The first rotation axis is the tool rotation axis, and the second rotation axis is the table rotation axis.



NOTE

A hypothetical axis is also counted as a controlled rotary axis.

<Hypothetical axis>

In some cases, it is convenient to use an imaginary rotary axis whose angle is fixed to a certain value. For example, suppose that a tool is mounted in a tilted manner through an attachment. In such a case, the rotary axis considered hypothetically is a hypothetical axis. Bits 0 and 1 of parameter No. 19696 determine whether each rotary axis is an ordinary roatry axis or a hypothetical axis.

19681	Controlled-axis number for the first rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the controlled-axis number for the first rotation axis.
For a hypothetical axis (when bit 0 (IA1) of parameter No. 19696 is 1), set 0.

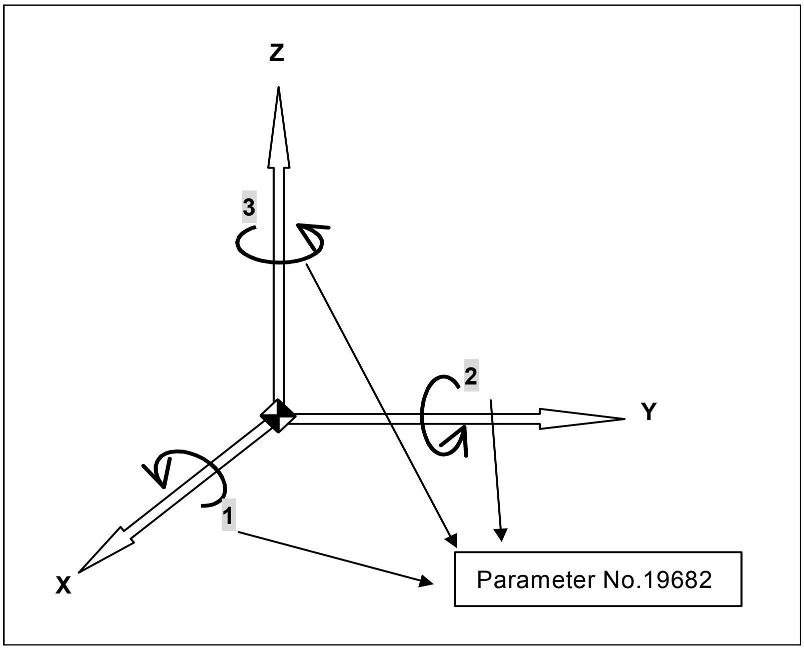
19682	Axis direction of the first rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 6

Specify the axis direction of the first rotation axis.

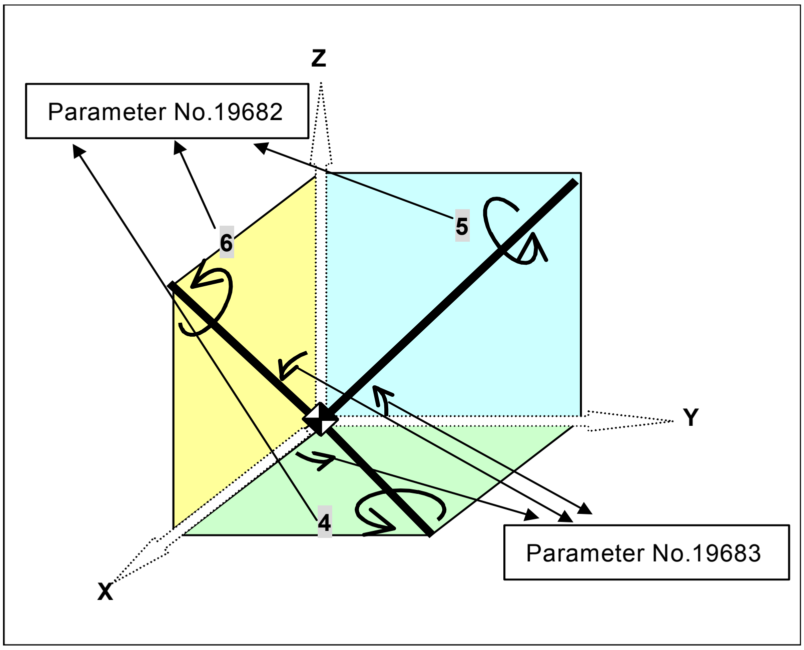
1: On X-axis
2: On Y-axis
3: On Z-axis
4: On an axis tilted a certain angle from the X-axis from the positive X-axis to positive Y-axis
5: On an axis tilted a certain angle from the Y-axis from the positive Y-axis to positive Z-axis
6: On an axis tilted a certain angle from the Z-axis from the positive Z-axis to positive X-axis

(A value 4 to 6 is to be set when the inclined rotation axis control function is used.)



19683	Inclination angle when the first rotation axis is an inclined axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] The increment system of the reference axis is to be followed.
[Valid data range] Nine digits of the least input increment (see standard parameter setting table (A).)
(-999999.999 to +999999.999 for IS-B)
When a value 1 to 3 is set in parameter No. 19682, set 0 degrees.
When a value 4 to 6 is set in parameter No.19682, specify the inclination angle.



19684	Rotation direction of the first rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 1
Set the direction in which the first rotation axis rotates as a mechanical motion when a positive move command is issued.
0: Clockwise direction as viewed from the negative to positive direction of the axis specified in parameter No. 19682 (right-hand thread rotation)
1: Counterclockwise direction as viewed from the negative to positive direction of the axis specified in parameter No. 19682 (left-hand thread rotation)
Normally, 0 is set for a tool rotation axis, and 1 is set for a table rotation axis.

19685	Rotation angle when the first rotation axis is a hypothetical axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

When the first rotation axis is a hypothetical axis (bit 0 (IA1) of parameter No. 19696 is 1), set the rotation angle.

19686	Controlled-axis number for the second rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to Number of controlled axes

Set the controlled-axis number for the second rotation axis.
For a hypothetical axis (bit 1 (IA2) of parameter No. 19696 is 1), set 0.

19687	Axis direction of the second rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 6

Specify the axis direction of the second rotation axis.

1: On X-axis
2: On Y-axis
3: On Z-axis
4: On an axis tilted a certain angle from the X-axis from the positive X-axis to positive Y-axis
5: On an axis tilted a certain angle from the Y-axis from the positive Y-axis to positive Z-axis
6: On an axis tilted a certain angle from the Z-axis from the positive Z-axis to positive X-axis

(A value 4 to 6 is to be set when the inclined rotation axis control function is used.)
When the second rotation axis is the slave axis, the direction when the master axis is at 0 degrees must be set.

19688	Inclination angle when the second rotation axis is inclined

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

If parameter No. 19687 is set to a value 1 to 3, set 0 degrees.

If parameter No. 19687 is set to a value 4 to 6, set the inclination angle.

19689	Rotation direction of the second rotation axis

[Input type] Parameter input
[Data type] Byte path
[Valid data range] 0 to 1

Set the direction in which the second rotation axis rotates as a mechanical motion when a positive move command is issued.

0: Clockwise direction as viewed from the negative to positive direction of the axis specified in parameter No. 19687 (right-hand thread rotation)

1: Counterclockwise direction as viewed from the negative to positive direction of the axis specified in parameter No. 19687 (left-hand thread rotation)

Normally, 0 is set for a tool rotation axis, and 1 is set for a table rotation axis.

19690	Rotation angle when the second rotation axis is a hypothetical axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

When the second rotation axis is a hypothetical axis (bit 1 (IA2) of parameter No. 19696 is 1), set the rotation angle.

	#7	#6	#5	#4	#3	#2	#1	#0
19696		RFC	WKP				IA2	IA1

[Input type] Parameter input
[Data type] Bit path

 # 0 IA1

0: The first rotation axis is an ordinary rotation axis.
1: The first rotation axis is a hypothetical axis.

If IA1 is 1, set 0 as the controlled-axis number for the first rotation axis (parameter No. 19681).
Also, set parameter Nos. 19682 to 19685 on the assumption that there is a rotation axis.

 # 1 IA2

0: The second rotation axis is an ordinary rotation axis.
1: The second rotation axis is a hypothetical axis.

If IA2 is 1, set 0 as the controlled-axis number for the second rotation axis (parameter No. 19686).
Also, set parameter Nos. 19687 to 19690 on the assumption that there is a rotation axis.

 # 5 WKP For a 5-axis machine having a table rotation axis, as the programming coordinate system for tool tip point control for 5-axis machining or cutter compensation for 5-axis machining:

0: The table coordinate system (coordinate system fixed on the rotary table) is used.
1: The workpiece coordinate system is used.

> **NOTE**
> For cutter compensation for 5-axis machining, the setting of this parameter is used only when bit 4 (TBP) of parameter No. 19746 is set to 1.

 # 6 RFC In tool center point control for 5-axis machining, when a command that does not move the tool center point with respect to the workpiece is issued, the feedrate of the rotation axis is:

0: The maximum cutting feedrate (parameter No. 1422).
1: A specified feedrate.

19697	Reference tool axis direction

[Input type] Parameter input

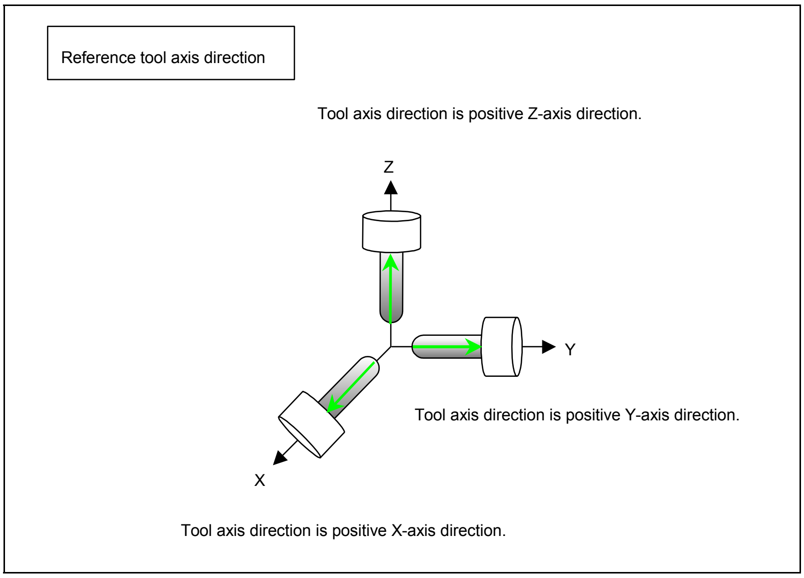
[Data type] Byte path

[Valid data range] 0 to 3

Set the tool axis direction in the machine coordinate system when the rotation axes for controlling the tool are all at 0 degrees. Also, set the tool axis direction in the machine coordinate system in a mechanism in which only the rotation axes for controlling the table are present (there is no rotation axis for controlling the tool).

1: Positive X-axis direction
2: Positive Y-axis direction
3: Positive Z-axis direction

When the reference tool axis direction is neither the X-, Y-, nor Z-axis direction, set the reference direction in this parameter, then set appropriate angles as the reference angle RA and reference angle RB (parameter Nos. 19698 and 19699).



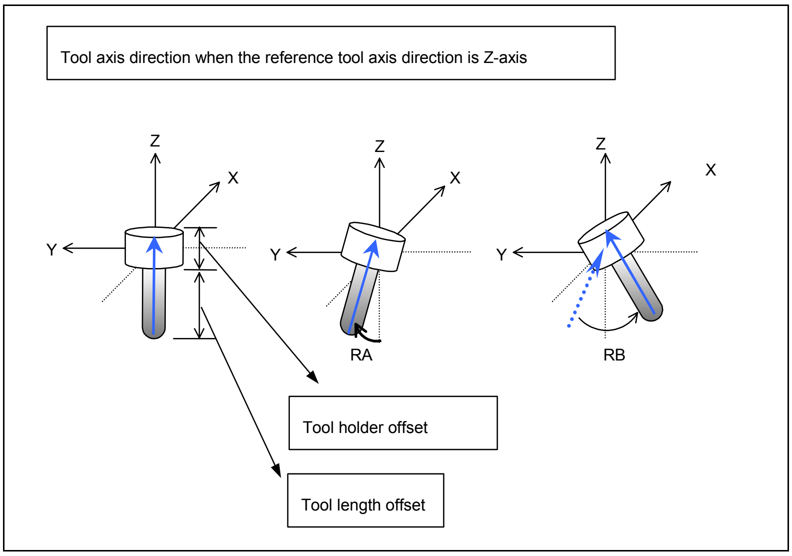
19698	Angle when the reference tool axis direction is tilted (reference angle RA)
19699	Angle when the reference tool axis direction is tilted (reference angle RB)

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

When the reference tool axis direction (parameter No. 19697) is set to 1, the tool axis is tilted the RA degrees on the Z-axis from the positive X-axis direction to positive Y-axis direction, then the tool axis is tilted the RB degrees on the X-axis from the positive Y-axis direction to positive Z-axis direction.

When the reference tool axis direction (parameter No. 19697) is set to 2, the tool axis is tilted the RA degrees on the X-axis from the positive Y-axis direction to positive Z-axis direction, then the tool axis is tilted the RB degrees on the Y-axis from the positive Z-axis direction to positive X-axis direction.

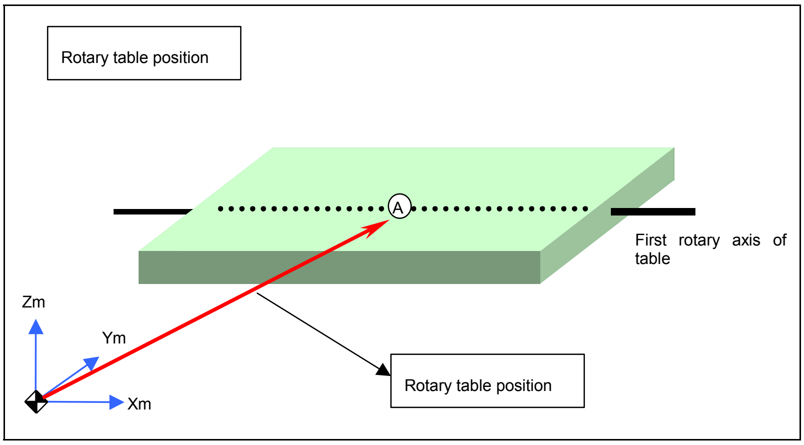
When the reference tool axis direction (parameter No. 19697) is set to 3, the tool axis is tilted the RA degrees on the Y-axis from the positive Z-axis direction to positive X-axis direction, then the tool axis is tilted the RB degrees on the Z-axis from the positive X-axis direction to positive Y-axis direction.



19700	Rotary table position (X-axis of the basic three axes)
19701	Rotary table position (Y-axis of the basic three axes)
19702	Rotary table position (Z-axis of the basic three axes)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set these parameters when parameter No. 19680 is set to 12 or 21. The vector from the origin of the machine coordinate system to point A on the first rotation axis of the table is set as the rotary table position in the machine coordinate system.

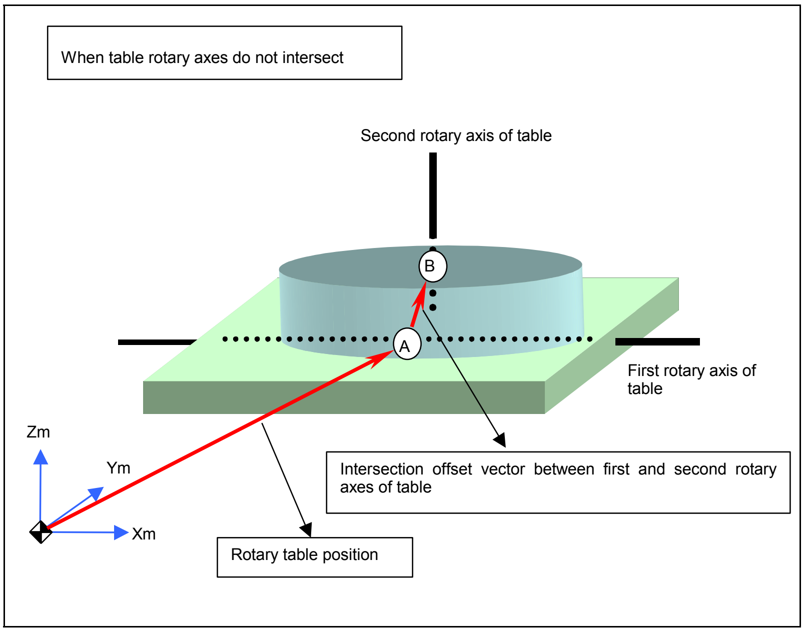


> **NOTE**
> As point A, set a position that is easy to measure on the first rotary axis of the table.
> Set a radius value.

19703	**Intersection offset vector between the first and second rotation axes of the table (X-axis of the basic three axes)**
19704	**Intersection offset vector between the first and second rotation axes of the table (Y-axis of the basic three axes)**
19705	**Intersection offset vector between the first and second rotation axes of the table (Z-axis of the basic three axes)**

[Input type]	Parameter input
[Data type]	Real path
[Unit of data]	mm, inch (machine unit)
[Minimum unit of data]	Depend on the increment system of the applied axis
[Valid data range]	9 digit of minimum unit of data (refer to standard parameter setting table (A)) (When the increment system is IS-B, -999999.999 to +999999.999)

Set these parameters when the first rotation axis and second rotation axis of the table do not intersect. These parameters are valid when parameter No. 19680 is set to 12. When the rotation axes for controlling the table are all at 0 degrees, the vector from point A to point B on the second rotation axis of the table is set as the intersection offset vector in the machine coordinate system.



> **NOTE**
> As point B, set a position that is easy to measure on the second rotary axis of the table.
> Set a radius value.

19709	**Intersection offset vector between the tool axis and tool rotation axis (X-axis of the basic three axes)**
19710	**Intersection offset vector between the tool axis and tool rotation axis (Y-axis of the basic three axes)**
19711	**Intersection offset vector between the tool axis and tool rotation axis (Z-axis of the basic three axes)**

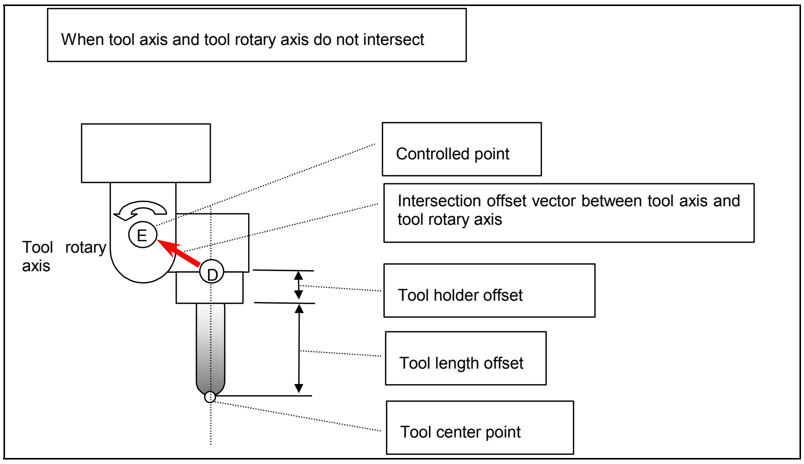
[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set these parameters when the tool axis and tool rotation axis do not intersect.

These parameters are valid when parameter No. 19680 is set to 2 or 21.

If parameter No. 19680 is 21, set the vector from point D on the tool axis to point E determined on the tool rotation axis as the intersection offset vector in the machine coordinate system when the rotation axes for controlling the tool are all at 0 degrees.

If parameter No. 19680 is 2, set the vector from point D on the tool axis to point E determined on the second rotation axis of the tool as the intersection offset vector in the machine coordinate system when the rotation axes for controlling the tool are all at 0 degrees.

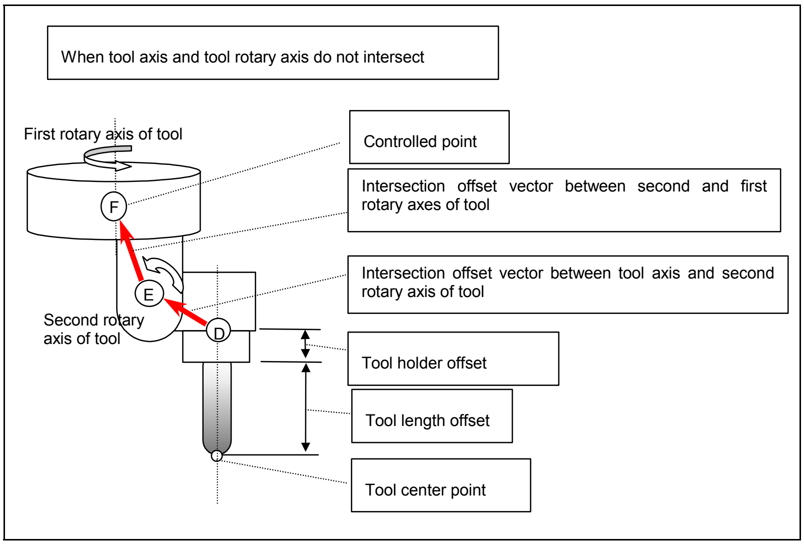


> **NOTE**
> Point D is determined by adding the tool length offset and tool holder offset (parameter No. 19666) to the tool tip. As point E, set a position that is easy to measure.
> Set a radius value.

19712	**Intersection offset vector between the second and first rotation axes of the tool (X-axis of the basic three axes)**
19713	**Intersection offset vector between the second and first rotation axes of the tool (Y-axis of the basic three axes)**
19714	**Intersection offset vector between the second and first rotation axes of the tool (Z-axis of the basic three axes)**

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the applied axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

Set these parameters when the rotation axes of the tool do not intersect.
These parameters are valid when parameter No. 19680 is set to 2.
Set the vector from point E on the second rotation axis of the tool to point F on the first rotation axis of the tool as the intersection offset vector in the machine coordinate system when the rotation axes for controlling the tool are all at 0 degrees.



NOTE
As point F, set a position that is easy to measure.
Set a radius value.

19741	Upper limit of the movement range of the first rotation axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

In tool center point control for 5-axis machining (type 2), cutter compensation for 5-axis (type 2), or tilted working plane command, set the upper limit of the movement range of the first rotation axis. When the movement range of the first rotation axis is not specified, this parameter and parameter No. 19742 must both be set to 0.

19742	Lower limit of the movement range of the first rotation axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

In tool center point control for 5-axis machining (type 2), cutter compensation for 5-axis (type 2), or tilted working plane command, set the lower limit of the movement range of the first rotation axis. When the movement range of the first rotation axis is not specified, this parameter and parameter No. 19741 must both be set to 0.

19743	Upper limit of the movement range of the second rotation axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

In tool center point control for 5-axis machining (type 2), cutter compensation for 5-axis (type 2), or tilted working plane command, set the upper limit of the movement range of the second rotation axis. When the movement range of the second rotation axis is not specified, this parameter and parameter No. 19744 must both be set to 0.

19744	Lower limit of the movement range of the second rotation axis

[Input type] Parameter input
[Data type] Real path
[Unit of data] Degree
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting
(When the increment system is IS-B, -999999.999 to +999999.999)

In tool center point control for 5-axis machining (type 2), cutter compensation for 5-axis (type 2), or tilted working plane command, set the lower limit of the movement range of the second rotation axis. When the movement range of the second rotation axis is not specified, this parameter and parameter No. 19743 must both be set to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
19746		CRS		TBP	LOZ	LOD		

[Input type] Parameter input
[Data type] Bit path

 # 2 LOD As the tool length for 5-axis machining manual feed:
0: The value of parameter No. 12318 is used.
1: The tool length currently used for tool length compensation is used.

 # 3 LOZ When bit 2 (LOD) of parameter No. 19746 is set to 1 and tool length compensation is not applied, as the tool length for 5-axis machining manual feed:
0: The value of parameter No. 12318 is used.
1: 0 is used.

 # 4 TBP For a 5-axis machine having a table rotation axis, as the programming coordinate system for cutter compensation for 5-axis machining:
0: The workpiece coordinate system is used.
1: The setting of bit 5 (WKP) of parameter No. 19696 is used.

 # 6 CRS In tool tip point control for 5-axis machining, when the deviation from the path during movement at the specified cutting feedrate or rapid traverse rate is determined to exceed the limit:
0: The feedrate or rapid traverse rate is not decreased.
1: The feedrate or rapid traverse rate is controlled so that the limit of the deviation from the path set in the parameter for the cutting feed or rapid traverse is not exceeded.

When this parameter is set to 1:
In the rapid traverse mode, the rapid traverse rate is decreased so that the deviation from the path does not exceed the limit specified in parameter No. 19751.
In the cutting feed mode, the cutting feedrate is decreased so that the deviation from the path does not exceed the limit specified in parameter No. 19752.

19751	Limit of the deviation from the path (for rapid traverse)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the limit of the deviation from the path in the rapid traverse mode in tool tip point control for 5-axis machining.
If the tool moves at the specified rate, the deviation from the path may exceed the value specified in this parameter. In this case, the rate is decreased so that the tool moves along the path.
This parameter is valid when bit 6 (CRS) of parameter No. 19746 is set to 1.
When 0 is set, the least input increment is assumed to be the limit of the deviation from the path.
If a negative value is set, the rapid traverse rate is not decreased.

> **NOTE**
> The error generated after the rate is decreased may be smaller than the value set in this parameter depending on the calculation error.

19752	Limit of the deviation from the path (for cutting feed)

[Input type] Parameter input
[Data type] Real path
[Unit of data] mm, inch (machine unit)
[Minimum unit of data] Depend on the increment system of the reference axis
[Valid data range] 9 digit of minimum unit of data (refer to standard parameter setting table (A))
(When the increment system is IS-B, -999999.999 to +999999.999)

This parameter sets the limit of the deviation from the path in the cutting feed mode in tool tip point control for 5-axis machining.
If the tool moves at the specified rate, the deviation from the path may exceed the value specified in this parameter. In this case, the rate is decreased so that the tool moves along the path.
This parameter is valid when bit 6 (CRS) of parameter No. 19746 is set to 1.
When 0 is set, the least input increment is assumed to be the limit of the deviation from the path.
If a negative value is set, the cutting feedrate is not decreased.

> **NOTE**
> The error generated after the rate is decreased may be smaller than the value set in this parameter depending on the calculation error.

APPENDIX

A CHARACTER CODE LIST

Character	Code	Comment	Character	Code	Comment
A	065		6	054	
B	066		7	055	
C	067		8	056	
D	068		9	057	
E	069			032	Space
F	070		!	033	Exclamation mark
G	071		”	034	Quotation marks
H	072		#	035	Sharp
I	073		$	036	Dollar mark
J	074		%	037	Percent
K	075		&	038	Ampersand
L	076		’	039	Apostrophe
M	077		(	040	Left parenthesis
N	078		)	041	Right parenthesis
O	079		*	042	Asterisk
P	080		+	043	Positive sign
Q	081		,	044	Comma
R	082		-	045	Negative sign
S	083		.	046	Period
T	084		/	047	Slash
U	085		:	058	Colon
V	086		;	059	Semicolon
W	087		<	060	Left angle bracket
X	088		=	061	Equal sign
Y	089		>	062	Right angle bracket
Z	090		?	063	Question mark
0	048		@	064	Commercial at mark
1	049		[	091	Left square bracket
2	050			094	
3	051		¥	092	Yen mark
4	052		]	093	Right square bracket
5	053		_	095	Underline

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Revision Record

FANUC Series 30*i*/300*i*/300*i*s-MODEL A, Series 31*i*/310*i*/310*i*s-MODEL A5, Series 31*i*/310*i*/310*i*s-MODEL A, Series 32*i*/320*i*/320*i*s-MODEL A PARAMETER MANUAL (B-63950EN)

Edition	Date	Contents	Edition	Date	Contents
02	May, 2004	Addition of functions Addition of following models - Series 31*i* /310*i* /310*i*s-MODEL A5 - Series 31*i* /310*i* /310*i*s-MODEL A - Series 32*i* /320*i* /320*i*s-MODEL A			
01	Apr., 2003	———			